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THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

VOLUME XXXVII CLEVELAND, O., MAY 12, 1904 NUMBER 19

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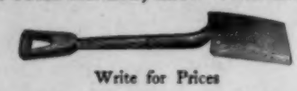

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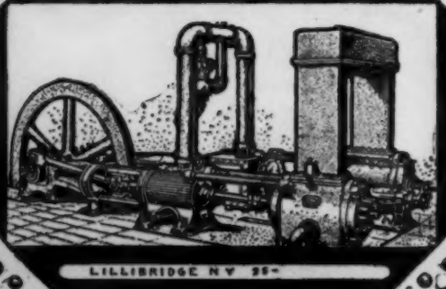

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THE IRON TRADE REVIEW

VOLUME XXXVII CLEVELAND, O., MAY 12, 1904 NUMBER 19

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Quietness and a tendency to weakness dominate the situation in iron and steel. The effect of the decision to have an open market this year on Lake Superior ores is widespread, and is evident not only in pig iron but also in certain finished lines. Whether the expectation of consumers is realized or not, the fact is, and it is making its impression upon the market, that lower prices are looked for. Their coming may be postponed, but meantime the opinions of buyers on this point are governing their action and free contracting under such conditions is not to be looked for.

Two or three factors of interest in the situation stand out on the general background of dullness. The plan to start the steel plant at Sault Ste. Marie, Ont., on the reorganization of the Consolidated Lake Superior Co. is one. With the government subsidy available, the decline of pig iron and ore prices makes steel rail manufacture at this plant more of a commercial proposition than it has yet been. The purchase of a large tonnage of Bessemer iron from Central Western interests is reported to be under negotiation, as well as of a considerable tonnage of coke. A second feature of interest in the week has been the contract for Pennsylvania tunnel castings. While details are not yet officially given out, it is understood that the New York Car Wheel Co., of Buffalo, and the Wheeling Mold & Foundry Co., of Wheeling, secure one-half each of 52,000 tons of castings for lining and 12,000 tons of castings for screw piles. The inquiry of the Wheeling concern for pig iron is now before several furnaces and sharp competition is expected. Deliveries of castings do not begin until 1905. It is expected that further contracts, including portions of the East River tunnel castings, will be let soon. Cast iron pipe business continues to interest furnaces. The 30,000 tons of pipe for Cincinnati are not yet let, but it is expected that Northern iron will enter into the bulk of this tonnage.

The pig iron market is dragging, and apart from the few large contracts, buying is expected to be of a hand-to-mouth character for some months. On Southern No. 2 $9.75 can now be done and it is intimated that $9.50 would be possible on any tonnage that would really test the market. Northern furnaces are naming lower prices than those of March and April and Southern producers must needs go below $9.50 on No. 2 to be considered competitive even on today's figures for Northern foundry iron. Bessemer iron is also weaker and $12.75 at furnaces is the market on ordinary lots.

The steel market is quiet and weaker, the association price on billets and sheet bars being cut from 50 cents to $1 in the Central West. The volume of business has apparently not been sufficient to lead to association action.

In finished materials the feeling that prices are to be subjected to severe tests, in view of the unsatisfactory outlook for the third quarter, is influencing the course of buyers. The push for tonnage by the large steel interests shows somewhat more intensity, and the various forms of encroachment upon agreed prices are a feature of the situation that while now borne with apparent equanimity are regarded as containing the key to developments in later months. After the fairly good bookings in standard section rails in April, business has shrunk again, a transaction of 8,000 tons in the St. Louis district being the largest reported for the week. The light rail orders current are eagerly competed for. Structural steel shows more activity, with some good business in prospect. Western bridge work and new buildings for Chicago call for 7,000 tons which has been let, while 3,000 tons for Baltimore is pending. A contract for steel sheds for Montreal wharves went to a Canadian firm, but it is probable that domestic steel interests will get the 20,000 tons involved, though German bidders are alert. Car orders from the Pennsylvania and Wabash systems, a portion of them for steel cars, will help plate and structural mills. Otherwise the plate situation is not improved. Ship yard demand seems to be at its lowest. Bar iron is weaker, and there has been a perceptible swing toward the use of steel in recent months. The struggle of sheet mills for business, which has been of fair proportions, has brought prices still lower, Eastern mills having entered territory ordinarily supplied by Central Western producers.

The lake situation may yet be a factor in the iron market. In spite of all predictions of a peaceable settlement with the labor unions, the masters' and pilots' demands are still some distance from adjustment.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, May 11.

The railroads, which earlier in the year were blamed for the depression in the iron and steel trade, are now doing a good part of the limited amount of buying, and much of the tonnage that will reach the mills in the near future will be for railroad work. The largest and only important inquiry for pig iron in the market today has been made by the Wheeling Mold & Foundry Co., of Wheeling, W. Va., for upwards of 30,000 tons of iron for delivery during eighteen months beginning July 1, this iron to be used in filling the contract awarded this concern for 32,000 tons of New York tunnel castings for the Pennsylvania railroad. Southern furnaces, as well as those in the Mahoning and Shenango Valleys, are bidding, and the indications are that the iron will be placed at exceedingly low prices, despite the fact that furnacemen are averse to selling iron so far ahead. Southern furnaces are making a strong effort for the business, but the probabilities are that a Valley stack will secure the order. The Wabash and Pennsylvania railroads are both in the market for cars and orders will be placed shortly. There is nothing definite about the requirements of the Wabash, the minimum being 1,000 and the maximum 5,000. Part of the order will be for all steel and part for combination freight cars. The Pennsylvania, in addition to the order placed recently, is in the market for 2,000 cars, and the placing of these orders will certainly help the plate mills, which have been suffering for want of tonnage for more than six months. The contract for the Chicago & Northwestern depot in Chicago was awarded the Fuller Co., while the structural work went to the American Bridge Co., requiring about 4,500 tons of steel. The McClintic-Marshall Construction Co. was awarded a contract for 1,200 tons of structural material by the Chicago & Indiana Western road to be used for bridges and crossings. At Baltimore the contract for the Maryland Casualty building has not yet been placed, all bids having been rejected and new ones asked for. Bids are also out for another building requiring about 1,500 tons of steel, so that the total in view from Baltimore now aggregates about 3,000 tons. Several local contractors bid on the erection of the new steel sheds for the Montreal, Canada, wharves, but the contract was awarded a Canadian concern. It is probable, however, that the structural work will come to this country and that the contract calling for 20,000 tons of steel will be sublet to one of the structural steel concerns in

this district. There is also a possibility of this steel being purchased in Germany, but this is not probable, as the mills in this country are so keen for tonnage that a price below that any German manufacturer can make will be named.

On pig iron only a nominal market exists in this district. Sales of a few small lots of iron have been made during the week, but not sufficient inquiries are out to invite competition and place the market on a basis looked for under an open ore market. In addition many furnaces anxious to protect contracts are not quoting prices at which they expect business, in view of the small tonnage which is being offered. On No. 2 foundry $12.50 Valley furnace is being quoted, although as high as $13.50 Pittsburg is asked. On Bessemer iron the last sales were made on the basis of $13 at the furnace, but $12.75 could be readily done for immediate delivery and for forward shipment there would be no trouble in doing $12.50 at the furnace. Southern furnaces are holding No. 2 at $9.75 Birmingham, but cannot take business at this price in competition with Northern furnaces. The majority of the merchant furnaces in the Valleys have cleaned up all their orders and are now merely waiting for something to turn up. That the demand for early iron will improve sufficiently during the next two weeks to insure the future operation of the stacks is not anticipated, and a pretty general shutting down of Valley stacks is looked for about June 1.

In finished lines, notably iron and steel bars, specifications have fallen off to a large extent, while the current business is very light. As the result of this decreased consumption the Republic Iron & Steel Co. has shut down its Bessemer plant at Youngstown temporarily, but an accumulation of orders in the next week or ten days will bring about its resumption. Bar mills in this district while not shutting down are running very light, while on plates most mills are running only at half capacity. However, this is a year of uncertainties and the disposition the railroads are showing to buy a little more freely will no doubt help matters materially from the present until well into the summer. The association prices on Bessemer and open-hearth sheets, bars and billets are now being openly shaded and billets can be laid down in this district at $22.50, while for Cleveland delivery $22.25 is being done. The principal steel mills in the association are not quoting below the agreed prices, mainly for the reason that not sufficient tonnage is being offered to warrant a reduction in the association prices.

On May 1, out of a total of 165 stacks using Lake Superior ores, only 35 were out of blast, the idle capacity based on a daily output of 47,782 tons, being only 10½ per cent. This brings blast furnace operations back to normal, but from present indications this condition will not continue for many weeks, yet the improvement since the first of the year has been phenomenal, the idle capacity on Jan. 1 amounting to 64½ percent.

Lower prices are again ruling for coke, sales of furnace being made at $1.50, while foundry is held at $2, although some special brands command as high as $2.50. Forced sales of both furnace and foundry coke have been made during the past few days at extremely low prices, Connellsville furnace having been sold as low as $1.40 and $1.45, while foundry has sold as low as $1.85. Coke production is beyond the consumptive capacity and some of the ovens in the upper and lower Connellsville region will again be compelled to go out.

Pig Iron.—Buying is extremely limited and sales have been hardly sufficient to establish a market. Lower prices prevail and consumers are looking for still further recession, owing to lower coke and ores. Outside of the inquiry for 30,000 tons of foundry iron for the Wheeling Mold & Foundry Co. there is practically no demand, although some buying of forge iron for several iron mills in this district for June delivery is looked for shortly. Southern furnaces with iron at $9.75 Birmingham are out of this market entirely. We revise quotations as follows:

Bessemer, Valley	$12 75 to 13 00
Bessemer, Pittsburg	13 60 to 13 85
No. 1 Foundry	13 75 to 14 00
No. 2 Foundry	13 35 to 13 60
Gray forge, Pittsburg	12 75 to 13 00
Chilled basic, Valley	12 50 to 12 75
Chilled basic, Pittsburg	13 35 to 13 60

Ferro-Manganese.—A large Western steel manufacturer is in the market for 500 tons of ferro and low prices are expected to be made on this order. On small lots $42 to $42.50 delivered is quoted, for domestic 80 percent, while large lots could be placed at $41 to $41.50.

Muck Bar.—There is little demand and the market is nominally $25.50 to $26 for neutral bars.

Spelter.—The market is weaker, and prime Western grades are quoted at 4.87c to 4.90c Pittsburg in carload lots.

Skelp.—There is little buying of skelp and the quotations are nominal as follows: Grooved iron 1.47c, sheared 1.52c to 1.55c, sheared steel 1.40c and grooved 1.35c.

Rails and Track Material.—The Reading railroad is reported in the market for 60,000 tons of rails, but this report cannot be verified. Light rails are weak and competition is keen for the small amount of business that is being offered. We make the following quotations: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; 16 to 40 pounds, $22.50 to $23. Track material: Spikes, 1.65c to 1.70c.

Plates.—The placing of additional orders for steel cars by the Pennsylvania railroad would greatly help out the plate situation. Lower prices than pool quotations are being named on narrow widths and by concerns not in the association, but on wide plates the market is being generally maintained. Few of the mills are running at their full capacity, and the indications are that operations will continue light for some months. We quote: Tank plates, ¼ inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.85c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plates 3-16 inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Steel.—Both Bessemer and open-hearth billets are now being offered in this market at $22.50 delivered, while sheet bars can be had at $23. Billets at Cleveland are being offered at $22.25. The leading steel mills are maintaining pool quotations, but are not taking any business. We quote association prices as follows: Bessemer and open-hearth billets, 4 x 4 inches, and slabs, up to and including 0.25 carbon, $23 Pittsburg, Wheeling, Valley, Johnstown, Ashland, Ky., Ironton, O. and Lorain, O.; 0.26 and including 0.60 carbon, $1 advance; and 0.61 to 1.00 carbon, $2 advance. Billets smaller than 3⅞ inches and sheets and tin bars are $1 per ton extra. Bessemer and open-hearth rods are still quoted at $30 to $31 Pittsburg.

Bars.—Specifications on bars have fallen off to some extent while new business is very light. Iron bars are now held at 1.35c, Pittsburg, while for Western shipment 1.25c to 1.30c is the basis for some mills instead of 1.35c, the price established some time ago. On steel bars prices are being firmly maintained. We revise quotations as follows: Bar iron, 1.35c to 1.40c Pittsburg, for local delivery, while for Western shipment quotations are based on 1.25c to 1.30c Pittsburg. Hoops are held at 1.40c base, and bands at 1.35c taking bar extras. Bessemer steel bars, 1.35c; open-hearth, 1.40c; plow beams and cultivator beams, 1.35c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.45c. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance.

Structural Material.—During the week the McClintic-Marshall Construction Co. received an order for 1,200 tons of material for crossings and bridges from the Chicago & Indiana Western railroad. The contract for the Chicago & Northwestern depot at Chicago went to the Fuller Company and the steel to the American Bridge Co. About 4,500 tons of material will be required. It is probable that the steel for the sheds to be erected on the Montreal wharves will go to mills in this country. The requirements are close to 20,000 tons. The steel requirements for two Baltimore buildings, for which bids are being asked, are 3,000 tons. Prices are unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Sheets.—The sheet tonnage that is being taken by the mills is only fair and low prices are being named to secure the business, Eastern mills being sharp competitors. On car-

load lots as low as 2.20c is still being named for 28-gauge black sheets. We make the following quotations on black sheets: No. 8, 1.75c to 1.80c; No. 9, 1.80c to 1.85c; Nos. 12-14, 1.90c; Nos. 15-17, 1.95c; Nos. 18-21, 2c; Nos 22-24, 2.05c; Nos. 25-26, 2.10c; No. 27, 2.15c; No. 28, 2.20c to 2.25c; No. 29, 2.50c to 2.55c; No. 30, 2.60c to 2.65c. Galvanized: Nos. 12-17, 2.35c; Nos. 18-21, 2.50c; Nos. 22-24, 2.65c; Nos. 25-26, 2.85c; No. 27, 3c; No. 28, 3.20c; No. 29, 3.60c; No. 30, 4c.

Tin Plate.—The American Sheet & Tin Plate Co. this week notified the Amalgamated Association of Iron, Steel and Tin Workers that beginning with June 1 the collection of the 25 percent rebate would be discontinued temporarily. Demand for tin plate is heavy and the stocks of the tin mills of the largest producer are being heavily drawn upon. Prices remain unchanged at $3.45 for 100-pound coke tins.

Wire and Wire Nails.—The amount of new business that is being placed is light, the mills all operating on orders, for the spring trade. The customary lull in the trade during the summer months accounts for the light buying at this time. Quotations remain unchanged as follows: Wire nails, carload lots to jobbers, f. o. b. cars Pittsburg, are quoted $1.90 base; plain wire, carload lots, $1.80 base; barb wire, carload lots, $2.20 base; staples, carload lots, $2.05 keg. Galvanized, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel and iron cut nails, carload lots, $1.75, and less than carload lots, $1.80 f. o. b. Pittsburg, plus freight to points of destination. Terms, 60 days, less 2 percent off in 10 days.

Merchant Steel.—New business is light and output at nearly all the mills in this district is being curtailed. We quote as follows: Toe calk, 1.90c; carriage spring steel, 1.75c; tire steel, 1.65c; plow steel, 6 inches and under, 1.40c for Bessemer and 1.45c for open-hearth; plow slabs, ¼ inch and heavier, 1.65c. The demand for shafting on the part of the machinery manufacturers is not heavy, and tonnage has therefore been considerably affected. Drawn, ground and cold rolled shafting is held at 52 percent off in carload lots and 47 off in less than carloads.

Pipes and Tubes.—Demand for merchant pipe has improved materially this month, while the tonnage in line pipe is extremely heavy. The pipe trade is in excellent condition. Discounts to consumers, carload lots f. o. b. Pittsburg, plus freight to destination according to Tube Rate Book, are as follows:

MERCHANT PIPE.

	Steel		Iron.	
	Black.	Galv.	Black.	Galv.
¼, ⅜, ½ inch	68	58	65	56
⅝ inch	71	61	69	59
¾ to 6 inch	75	65	73	63
7 to 12 inch	71	61	68	58
Ex. Stg., plain ends, ¼ to 8 in.	67	57	64	54
Double Ex. Stg., pl. ends, ⅜ to 8 in.	59	49	56	46

BOILER TUBES.

	Steel.	Iron
1 to 1⅜ inch	42½	39
1½ to 2¼ inch	55½	38
2½ inch	58	42
2¾ to 6 inch	64½	50½
6 to 13 inch	55½	38

Old Material.—There is practically no market for old material of any grade. Heavy melting stock offered at $12.50 this week was refused by a large mill, while on cast scrap the market is nominally $11. Rerolling rails are lower and are held at $13 to $13.25.

Coke.—The coke market is lower, due largely to the large output of the region. A number of coke producers are shipping into this district on consignment and these lots are of course being sacrificed. On furnace coke the prevailing quotations range from $1.45 to $1.50, while on foundry coke $1.95 to $2 is being freely done. A few special grades of coke, however, command as high as $2.50. During the week ending Saturday, April 30, the production of the upper Connellsville region reached 211,487 tons, while that of the lower region was 55,478 tons, showing a slight increase over the output of the previous week.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, May 10.

This market shows no features of unusual interest. Such buying as has been done during the week was for the supply of immediate needs. Not for weeks has the market had such an indifferent appearance, and were it not for the good volume of specifications there might be cause for discouragement over the outlook. This feature, however, counterbalances the dullness in new business and serves to uphold the buoyancy of the market. The demand for merchant pipe and a better call for structural steel in small lots and for other finished products entering into the construction of buildings, has filled up a gap created by a cessation in demand for materials going to makers of agricultural machinery. The falling off in the latter line is due largely to the fact that the manufacture of farming machinery for sale this summer is nearly over and that for the next two months, these interests will be working off their present stocks in preparation for the taking of inventory in July. Railroad business continues dull in all departments. The inquiry for heavy rails is of good proportions, but only a small part results in orders. Prices of finished iron and steel are unchanged. In sheets, boiler tubes and on certain sizes of plates, the cutting that has been reported in past weeks continues. Pig iron is from 25 cents to 50 cents a ton lower than a week ago, and scrap is off $1 to $1.50 a ton. The coke market is demoralized by the frequent sales to escape car demurrage, and some very low prices have been made during the week on both Connellsville and Virginia grades.

Pig Iron.—Enough sales of Southern iron were made in the past week on the basis of $9.75 Birmingham for No. 2 foundry to establish that price. It is reported that this was not the lowest quotation made during the week, a desirable order having brought out one bid at $9.50 and another at $9.60. Some of the leading interests are still maintaining the $10 schedule, but these generally are filled up for the next three months or so, and are not anxious at the present time about new business. It is fair to state, however, that the $9.75 price has been made as a rule on lots averaging about 500 tons. Much interest prevails as to the course of Northern furnaces in view of the lower prices on Southern grades. The $14 schedule is still in force, but Southern No. 2 is selling at $13.40 Chicago and it is not expected that so wide a parity can be maintained for long in the present state of the market. There is not enough demand for Northern iron just now to properly gauge the situation, and local producers assert that, as in the past, they will be governed largely by the size of the order and their desire to have it in naming their price. The buying of the week has been light and provided largely for immediate needs. There were some lots of 500 tons and over, but transactions in the main were for car lots. We have revised our quotations as follows:

Lake Superior Charcoal	$15 00 to 15 50
Northern Coke Foundry No. 1	14 50 to 14 75
Northern Coke Foundry No. 2	14 00 to 14 25
Northern Coke Foundry No. 3	13 50 to 13 75
Northern Scotch Foundry No. 1	14 50 to 14 75
Ohio Strong Softeners No. 1	15 50 to 15 60
Ohio Strong Softeners No. 2	14 50 to 15 50
Southern Coke Foundry No. 1	13 90 to 14 15
Southern Coke Foundry No. 2	13 40 to 13 65
Southern Coke Foundry No. 3	12 90 to 13 15
Southern Coke Foundry No. 4	12 40 to 12 65
Southern No. 1 Soft	13 90 to 14 15
Southern No. 2 Soft	13 40 to 13 65
Southern Gray Forge	12 40 to 12 90
Southern Mottled	12 15 to 12 65
Southern Silveries (4% to 6% Silicon)	14 85 to 15 85
Jackson Co. Silveries (8% to 10% Silicon)	17 50 to 18 50
Alabama and Georgia Car Wheel	18 85 to 19 25
Malleable Bessemer	14 00 to 14 50
Alabama Basic	13 65 to 13 90
Virginia Basic	14 35 to 14 60

Billets.—Except for a slight demand for small lots of axle and forging billets, the market is without interest. Association prices are being generally maintained in this district. We quote Bessemer and open-hearth billets, 4 x 4 and larger, up to .25 carbon, $24; up to and including .60 carbon, $1 extra; over .60 carbon, $2 extra. Axle and forging billets, smaller than 4 x 4, $25 Chicago. Open-hearth billets from store, $1.30 per 100 lb.

Iron and Steel Bars.—New business has been light in both iron and steel during the past week. Specifications, however, continue in good volume, though a falling off is to be noted in those from the agricultural trade. The season for these interests is about over and for the next two months it is expected that consumers will be working off their present stocks in preparation for the taking of inventory in July. Prices are unchanged for carload lots, mill shipments, Chicago delivery: Bar iron, 1.45c, full extras; soft steel bars,

1.51½c half extras; with 5c to 10c per 100 pounds extra for less than a carload lot and with the regular extras for less than a ton of a size; angles, less than 3 x 3, 1.56½c base, half extras; hoops, 1.56½c full extras. On lots from store, we quote iron, 1.65c; steel, 1.70c base, half extras; hoops, 2c full extras.

Sheets.—There is little change to be noted in the situation. Demand is good, both in the way of new business and specifications, and mills complain of no lack of business. There is still considerable competition between the various producing interests, however, in which prices are shaded on desirable orders. On mill shipments, Chicago delivery, for one pass, cold rolled sheets, we quote: Nos. 16 and 17, 2.16½c; Nos. 18 and 21, 2.21½c; Nos. 22 and 24, 2.26½c; Nos. 25 and 26, 2.31½c; No. 27, 2.36½c; No. 28, 2.46½c; No. 29, 2.76½c; No. 30, 2.86½c. Galvanized sheets, carload lots, mill shipment, Chicago delivery: Nos. 16 and 17, 2.56½c; No. 18 and 21, 2.71½c; Nos. 22 and 24, 2.86½c; No. 25 and 26, 3.06½c; No. 27, 3.26½c; No. 28, 3.46½c; No. 29, 3.86½c; No. 30, 4.26½c. On small lots from store, we quote black sheets as follows: Nos. 8 and 10, 2.15c to 2.20c; No. 12, 2.20c to 2.25c; No. 14, 2.30c to 2.35c; No. 16, 2.40c to 2.45c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.65c to 2.70c; No. 27, 2.75c to 2.80c; No. 28, 2.80c to 2.85c; No. 29, 2.95c to 3c; No. 30, 3.10c to 3.25c. Galvanized, 75 and 7½ percent on gauges 16 and heavier and 75 and 10 percent on gauges 18 and higher.

Structural Steel.—One contract for a building to be erected in this city requiring about 1,500 tons of steel was let during the week. There was also a good demand in lots of 200 tons and thereabouts. We quote: Beams and channels, 16 inches and under, 1.76½c; 18 inches and over, 1.86½c; universal plates, 1.76½c; angles 3 x 3 and larger, 1.81½c; zees, 1.76½c. On lots from store, we quote beams, channels and angles, 3 x 3 and larger, 2c; 18, 20 and 24-inch, 10c extra; tees, 2.05c rates.

Plates.—There was a good scattering of orders placed in the past week. Mills report a little more activity than for some time, and assert also that specifications are improving. There are no changes in prices, and we continue to quote on carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼-inch and heavier, 1.76½c; flange steel, 1.86½c; marine, 1.96½c; universal mill plate, 1.76½c to 1.81½c; 3-16 inch tank, 1.86½c; Nos. 7 and 8, 1.91½c; No. 9, 2.01½c; No. 10, 1.91½c; No. 11, 1.96½c; No. 12, 2.01½c. From store, we quote tank steel, ¼ inch and heavier, 2c; 3-16, 2.15c; No. 8, 2.20c; No. 10, 2.25c; flange steel, 2.25c to 2.35c, all f. o. b. warehouse.

Rails and Track Supplies.—Projects for the construction of electrical and interurban systems appear to be numerous judged by the number and variety of inquiries received by mills for heavy rails. Few of these, however, get beyond the initial stage. Some small lots were placed during the week, but the total tonnage was not large enough to cause comment. Light rails are quiet and prices weak. There is a fair movement in track supplies. Prices are unchanged, and we quote heavy rails, 500 tons and over, $28: less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, $24 to $28, with regular differentials for intermediate sizes. The following quotations on track supplies, which are f. o. b. Joliet mill, may be shaded on large orders. Angle bars, 1.40c to 1.50c; spikes, first quality, 1.70c to 1.80c (out of store, 1.90c rates); track bolts, 3½ x ¾, with square nuts, 2.40c to 2.50c per 100 pounds; with hexagon nuts, 2.55c to 2.65c, with usual differentials for other sizes.

Merchant Steel.—Producers report further small contracts closed in the past week with implement manufacturers. The good volume of specifications, however, is the best feature of the trading in these materials. Prices are firm and we quote carload lots, mill shipments, Chicago delivery, as follows: Spring steel, 2c; sleigh shoe, flat sizes, 1.56½c; concave and convex, 1.76½c; cutter shoe, 2.25c; smooth finished machinery steel, 1.76½c base; smooth finished tire, 1.71½c; plow steel, 2.30c and upward, according to quality; toe calk, 2.06½c base. Ordinary grades of crucible tool steel, 6½c to 8c; special tool steel, 12c and up. Cold rolled shafting, 52 percent from list in carload lots, and 47 percent discount in less than car lots.

Merchant Pipe.—The improvement in specifications noted last week continues in a larger measure. Most of the material going forward is on building contracts. Prices are without change, and we quote carload lots, mill shipments, random lengths, f. o. b. Chicago as follows:

	Steel Pipe.		Guar. Wrought Iron.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ⅜ inch	66.35	56.35	64.35	54.35
½ inch	69.35	59.35	67.35	57.35
¾ to 6 inches	73.35	63.35	71.35	61.35
7 to 12 inches	69.35	59.35	66.35	56.35

Less than carloads, 12½ per cent. advance.

Boiler Tubes.—A fair amount of business comes forward each day and the market may be said to be slowly improving. Some independent interests are cutting the prices of the leading producer, but not enough to affect the situation to any noteworthy degree. We continue to quote on carload lots, mill shipments, as follows:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	43.35	40.35	38.35
1¾ to 2¼ inch	55.35	38.35	40.35
2½ inch	58.35	43.35	40.35
2¾ inch to 5 inch	64.35	50.35	Up to 4 inches. 43.35
6 to 13 inch	55.35	38.35	

For car lots or less direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	40	35	37.50
1¾ to 2½ inch	50	32.50	35
2¾ to 5 inch	60	45	Up to 4 inches. 45
6 to 13 inch	50	32.50	

Wire Products.—While specifications are active, new business is dull. This statement sums up the local situation. Prices are firm and unchanged. We quote to jobbers, carload lots, as follows: Wire nails, carload lots, $2.10; less than carload lots, $2.15; cut nails, carload lots, 1.91½c base; less than carload lots, 1.96½c; smooth wire, carloads, $2, and $2.05 for less than carload lots; galvanized smooth wire, $2.30 in carloads, and $2.35 in lesser amounts; painted barbed wire, $2.40 carloads, and $2.45 in less than carload lots; galvanized barbed wire, $2.70 carloads, and $2.75 less than carload lots. Staples, polished, carloads, $2.25; less than carload lots, $2.30; galvanized, $2.55 carloads and $2.60 less than carload lots. Bale ties, 82½ and 5 percent discount, f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or De Kalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Foundry Coke.—Demand for coke is limited, and the market is in such a demoralized state that it needs a fancy price to bring consumers to the point where they are willing to consider placing an order. Considerable coke is on track in this city, and in order to escape paying car demurrage many sales are made at an actual loss to the seller. Standard 72-hour Connellsville has sold as low as $4.15 during the week, and Southern grades in proportion. On contracts, however, though there is nothing doing in this line, Connellsville foundry coke is held at from $2 to $2.25 at the ovens, and Southern grades from $4.25 to $4.75 Chicago.

Old Material.—Further weakening of prices is to be noted, and some products are off from $1 to $2 a ton. The slump is caused by the heavy offerings of railroad and the total disappearance of any demand from consumers. During the past week the Milwaukee & St. Paul railroad unloaded on this market 3,000 tons, the Illinois Central 600 tons, and other roads smaller lots. In addition, the Rock Island has a list out embracing about 4,000 tons, on which it is asking bids. We have revised our quotations and quote dealers' selling prices, as follows:

Old iron rails	15 50 to 16 50
Old steel rails (mixed lengths)	9 25 to 9 75
Old steel rails (long lengths)	11 50 to 12 00
Relaying rails	23 00 to 24 00
Old wheels	12 00 to 12 50
Heavy melting steel	10 00 to 10 50
Mixed country steel	7 50 to 8 00

The following are selling prices for net tons:

Low phosphorus scrap (.04 and under)	$12 00 to 13 00
No. 1 R. R. wrought	11 50 to 12 00
No. 2 R. R. wrought	10 50 to 11 00
Shafting	13 50 to 14 00
Dealers' forge No. 1.	9 25 to 9 75
No. 1 cast	11 50 to 12 00
No. 1 busheling and wrought pipe	9 00 to 9 50
Heavy cast (300 pounds and over)	8 50 to 9 25
Agricultural malleable	9 00 to 9 50
Iron axles	16 50 to 17 00
Steel axles	14 50 to 15 00

No. 1 boilers, cut	$8 50 to 9 00
Boiler Punchings	9 00 to 9 50
Cast borings	4 25 to 4 75
Mixed borings, etc.	4 25 to 4 75
Wrought turnings	7 00 to 7 50
Machine shop turnings	7 00 to 7 50
Iron axle turnings	8 00 to 8 50
Steel axle turnings	8 00 to 8 50
Stove plate and light cast scrap	9 00 to 9 50
Old iron splice bars	13 50 to 14 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*, 1064 ROSE BUILDING, May 10.

There have been some preliminary negotiations this week between sellers and consumers of ore, but very little progress has been made, as nearly all furnaces have supplies which will meet their requirements for several months, apart from possible shortage on particular ores. There is much uncertainty as to what prices will prevail, but at present sellers are adhering pretty closely to the basis of $3.50 for old-range Bessemer and $2.85 for old range non-Bessemer. Some furnacemen have shown a strong desire to ascertain the probable policy of the United States Steel Corporation in regard to selling ore. The corporation has heretofore sold only a limited amount of ore, and latterly its shipments for others were practically confined to old contracts. Those most closely in touch with the corporation say that it is not likely it will change its policy this year except that it may make conversion deals if it should need to buy pig iron. Having acquired the Clairton furnaces, it does not seem probable that the corporation will have any difficulty, for some time to come, in carrying out its contract to furnish steel and pig iron to the Crucible Steel Co., and in meeting its own requirements from its own stacks.

The lake carriers and captains have not yet agreed upon the wage scale. The captains have conceded the right of vessel owners to discharge as they please and other matters of difference have been adjusted, but the union asks for a uniform scale of wages which in the aggregate would amount to a considerable increase, while the vessel men offer to pay last year's wages, which were determined by the ability of the captains as well as by the size of the vessels, thus, in the opinion of the employers, rewarding merit. The mates are very much dissatisfied with the proposed plan of paying them by the month while the masters are paid by the season. On the whole, the prospect of early settlement of wage questions on the lakes is not favorable. Shipping of ore may be delayed until after June 1. A number of railroads have discontinued the acceptance of rail and lake freight pending the settlements with the unions. This action was necessary on account of the accumulation at lake ports of freight which could not be forwarded.

Pig Iron.—In spite of the well known fact that a reduction of about $1 per ton in the price of ore was discounted Jan. 1 by nearly all furnaces, the announcement of the failure of the ore interests to agree on prices and the uncertainty as to what quotations would be made have had a depressing effect on the pig iron market and sales have been small, the only exception being a sale of 3,000 tons to a car and foundry company. Prices, however, are pretty firm and show little change. In the Valley, sales are being made at $12.50 for No. 2, but $12.75 has been paid for some brands. The usual price for Southern No. 2 foundry is $9.75 Birmingham, or $13.60 Cleveland. Very little business is being done. In Cleveland, local furnaces are selling at $13 to $13.25 at the furnace for No. 2. We quote as follows for Cleveland delivery save on Northern gray forge, which is at Valley furnace:

Bessemer	$13 60 to 13 85
No. 1 Strong Foundry	13 85 to 14 00
No. 2 Strong Foundry	13 25 to 13 50
No. 3 Foundry	12 40 to 12 75
No. 2 Southern	13 60 to 13 85
Gray Forge, Valley furnace	12 15 to 12 40
Gray Forge, Southern	13 00 to 13 10
Lake Superior charcoal	14 35 to 14 50

Finished Material.—The demand does not improve. Steel bars at 1.44½c Cleveland or 1.35c Pittsburg are sold in very small quantities. The principal producers are adhering to the price 1.44½ Cleveland for bar iron, but the demand is very limited, and mills not a party to the agreement are selling such sizes as they make at lower prices. Competition in sheets continues, with independent producers quoting $2 to $3 under the prices of the principal producer, which, through jobbers, are as follows: Mill sales of black sheets, No. 10, 1.75c; No. 11-12, 1.80c; No. 14, 1.85c; No. 16, 1.95c; No. 27, 2.20c; No. 28, 2.30c. Galvanized, 80, and 3 off. Out of stock prices are as follows: No. 10, 2.10c; No. 12, 2.15c; No. 14, 2:20c; No. 16, 2:30c; No. 18-20, 2.40c; No. 24, 2:45c; No. 25-26, 2.50c; No. 27 2.55c; No. 28, 2.65c; No. 30, 3.10c. Galvanized out of stock, 75, 10 and 5 off.

Old Material.—Prices are still tending downward and fair orders could doubtless be placed at from 25 to 50 cents below the following quotations, but, on account of the small number of sales, it is difficult to determine exactly what the market prices are. We quote as follows for gross tons Cleveland:

Old iron rails	$18 00 to 19 00
Old steel rails (over 6 feet)	13 00 to 14 00
Old steel rails (6 feet and under)	13 00 to 13 50
Old car wheels	12 00 to 13 00
Steel boiler plates	10 00 to 11 00
Malleable iron (railroad)	11 50 to 12 00
Malleable iron (agricultural)	10 00 to 10 50
Heavy steel	11 00 to 12 00

We quote the following net tons:

No. 1 R. R. Wrought	$13 00 to 13 50
No. 1 busheling	11 00 to 11 50
No. 1 machine cast scrap	11 50 to 12 00
Iron axles	16 50 to 17 50
Axle turnings	8 00 to 9 00
Wrought turnings (free from cast)	7 00 to 7 50
Uncut wrought iron boilers	5 00 to 6 00
Grate Bars	8 00 to 9 00
Pipes and flues (clean)	10 00 to 10 50
Tank iron	9 50 to 10 50
Hoop and band iron	5 00 to 6 00
Sheet iron	4 00 to 5 00
Wrought drillings	7 00 to 7 50
Stove Plate	8 00 to 8 50
Steel axles	14 00 to 15 00
Cast borings	5 00 to 5 50

CINCINNATI.

May 10.

The coke market remains quiet and easy. The brands with high reputation are selling at $2.15 to $2.25 f. o. b. Connellsville as asking prices, but less known brands are quoted at figures ranging from $1.75 to $2 at ovens.

Pig Iron.—The amount of business the past week is small. The largest sale reported was 1,000 tons of pipe iron, but the price was not given out. A purchase for Indianapolis, amounting to several hundred tons of foundry iron, was the most notable transaction of the week, for the reason that it served as an indication of what might be expected to develop in the way of prices, under competition for business by the furnaces. An Ohio furnace is believed to have taken a part of the business at about $12.35 at the furnace for No. 2 foundry, and some Southern iron is understood to have sold at less than $9.75, Birmingham, for No. 2 foundry. Trade talk is rather inclined toward pessimism. Salesmen report buyers apathetic. There is not much disposition to combat prices, but the buyer's attitude is one of indifference and a disposition to wait until he is in need of iron. Southern iron is openly and freely offered at $9.75, Birmingham, for No. 2 foundry without arousing any interest.

In Northern iron lower prices are obtainable, but there is so little business to be had that it is difficult to ascertain just what Northern furnaces would be willing to quote to secure orders. It has been suggested, rather confidently, that in Southern Ohio (Ironton district) $12.25 at furnace for No. 2 foundry could be done, and at furnaces in the northern part of the State $12.50 at furnace for No. 2 would be about minimum. These figures are more reflective of the situation than actual quotations, but are sufficiently close to the mark to be regarded as a correct indication of the present condition of prices. As is usual on a weak market, the cost of producing iron in the various districts is under discussion, but with ore prices so uncertain, Northern furnace costs are variable. It is also believed that Ohio furnaces still have considerable ore on hand bought at last year's schedule, but how much farther these furnaces would be willing to go in working off this old ore and selling at a loss is a factor having some bearing on the situation. Current prices f. o. B. Cincinnati are:

Southern Foundry No. 1	$13 00 to 13 50
Southern Foundry No. 2	12 50 to 12 75
Southern Foundry No. 3	12 00 to 12 25
Southern Foundry No. 4	11 75 to 12 00
Southern Foundry No. 1 soft	13 00 to 13 50
Southern Foundry No. 2 soft	12 50 to 13 00
Gray Forge	11 50 to 11 75
Northern Foundry No. 1	13 90 to 14 15
Northern Foundry No. 2	13 40 to 13 65
Northern Silvery (8% silicon)	16 15 to 16 65
Southern car wheel iron	16 75 to 17 00

Finished Material.—The market continues quiet and there is an easy tone prevailing for nearly all descriptions. Quotations below represent the current going prices, but the market is easy at the quotations. Retail prices for some sizes of sheets are a shade lower. Bar iron is quoted at 1.45c f. o. b. Steel bars, 1.48c base, half extras, with dealers quoting 1.75c to 1.90c for iron and steel out of store. Galvanized sheets are being quoted at 75 and 10 to 75, 5 and 2½ percent off. We quote black sheets, No. 27, at 2.45c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.80c; No. 27, 2.70c; No. 16, 2.35c; No. 14, 2.30c; No. 12, 2.35c; No. 10, 2.20c. Tank plates are dull and sell out of store at 2c for ¼-inch and 2.10c for 3-16 inch. Beams and channels are quoted at 2c from stock and angles at 1.90c to 2c for base sizes.

In merchant pipe there is some improvement in the demand and the market has a steadier tone than for some weeks. It is reported that schedule prices are being adhered to now more closely than for some time. We quote for carload lots f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	64.7	54.7
½ inch	69.7	59.7	67.7	57.7
¾ to 6 inch, inclusive	73.7	63.7	71.7	61.7
7 to 12 inch, inclusive	69.7	59.7	66.7	56.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	27.7
1¾ to 2¼ inch	54.2	36.7
2½ inch	56.7	41.7
2¾ to 5 inch	63.2	49.2
6 to 12 inch	54.2	36.7

Old Material.—The market is easy in tone but there is no quotable change in prices. Trade is quiet. We quote:

Old No. 1 railroad wrought, net tons	$11 50 to 12 00
Cast machine and foundry, net tons	11 00 to 11 50
Old iron rails, gross tons	16 00 to 16 50
Old steel rails, gross tons	12 50 to 13 00
Old short lengths, gross tons	11 00 to 12 00
Old iron axles, net tons	15 50 to 16 50
Stove plate, net tons	9 50 to 10 50
Wrought turnings, net tons	7 50 to 8 00
Cast borings, net tons	4 50 to 5 50

BIRMINGHAM, ALA.

Mgy 10.

BIRMINGHAM, Ala., May 9.—The pig iron market in the Southern territory is not quite in the same category as the Northern market. There is a fairly good inquiry being received by the manufacturers in this section though an effort is being made by consumers to bring about a reduction in quotations, intimating that the dullness is to continue anyhow through the election period. The Southern manufacturers are in a position to hold steady, having booked orders well ahead until July 1 with a few sales already made for a longer period. In the next week or two some of the larger companies that have been out of the market on certain grades because of the large volume of business taken in during March and the first part of April, will begin to sell for delivery during the third and fourth quarters of the year. In some quarters it is believed that this will have a tendency to bear down on the market and force prices lower. The accumulation of iron in this section is nil at present and there are no apprehensions for the third quarter of the year.

The higher prices for pig iron in the past two months appear in the fact that the coal miners were granted an advance of 2½ cents per ton for mining under a contract in which the average selling price of pig iron is the basis. The miners have been working under a minimum wage of 47½ cents per ton for mining. The investigation of the iron selling books warranted the advance and it was announced on Saturday last.

The production in Alabama is holding up well, furnaces breaking records in individual production. The Sloss-Sheffield Steel & Iron Co., with six of its seven furnaces in operation, produced more iron in April than in any one of the several months previous, even when seven furnaces were in operation, 35,000 tons and over being the report for last month. J. J. Shannon, who a few weks ago became general furnace manager of the company, is making some improvements about the furnaces.

The following pig iron quotations are given: No. 1, foundry, $10.25 to $10.50; No. 2 foundry, $9.75 to $10; No. 3 foundry, $9.50 to $9.75; No. 4 foundry, $9 to $9.25; gray forge, $8.75 to $9; No. 1 soft, $10.50; No. 2 soft, $10 to $10.50.

Progress is being made on the new furnaces being erected in this State, one at Woodward, one at Ensley and one at Battelle. All three will be equipped with the most modern machinery and will have daily outputs of 250 to 300 tons of iron. The furnace at Battelle will probably go in blast July 1.

The steel plant of the Tennessee Coal, Iron & Railroad Co., at Ensley, is making a good output of steel rails. The plant of the Alabama Steel & Wire Co., manufacturing steel rods, wire and nails, lost several days the past week on account of the water supply. All work will be resumed in the plant this week. The plant has a steady demand for its product. This company is pushing the work on the steel plant being erected at Gadsden and it is expected to be ready for operation by June. The company expects to manufacture all the steel it can use in the rod, wire and nail mills at Ensley at the new plant.

The Bessemer rolling mills, belonging to the Tennessee Coal, Iron & Railroad Co., are running slack on account of a shortage in the raw materials and a strike in several departments. The Gate City mills of the Republic Iron & Steel Co. have been doing nicely of late, though there has been a scarcity of water at this plant also.

The experts appointed by the Republic Iron & Steel Co., Tennessee Coal, Iron & Railroad Co., and the Sloss-Sheffield Steel & Iron Co., to investigate the values of coal and ore properties, the first intentions being to consolidate the three companies, will be ready with their report about June 1.

PHILADELPHIA.

May 10.

The market is very quiet and there are no indications of improvement. Newspaper reports of the failure of the ore interests to agree on prices have exaggerated the importance of the disagreement and have caused buyers to be more cautious. As pig iron has been selling at very low prices, it is not probable that quotations will be much lower.

Pig Iron.—New business is light, but deliveries are being called for promptly and tonnage on the books is decreasing. Prices show little change. No. 2 X foundry, Northern, sells at about $15 and Southern at $14.50. We quote: No. 1 X foundry, $15.50 to $16; No. 2 X foundry, $15 to $15.25; No. 2 plain, $14.50 to $14.75; Alabama No. 2 rail shipment, $14.25 to $14.50; Alabama No. 2, on dock, $13.50 to $13.75; standard gray forge, $13.75 to $14; ordinary gray forge, $13 to $13.25; basic, $14 to $14.10.

Finished Material.—Demand is not as strong as it was a week or two ago and prospects for improvement are not bright. The building trade is still unsettled on account of strikes. We quote as follows: Beams, channels and angles, 1.73½c to 1.85c, according to the specifications, and small angles, 1.50c to 1.55c; bars, both iron and steel, 1.48½c to 1.55c; skelp, 1.45c to 1.50c seller's mill for grooved and a tenth more for sheared.

Old Material.—The market is extremely dull and prices are weak. We quote: Old steel rails, $15 to $15.50; miscellaneous heavy steel, $14 to $14.50; low phosphorus scrap, $17.50 to $18; old steel axles, $16 to $17; old iron axles, $21 to $22; old iron rails, $17.25 to $18; old car wheels, $12 to $13; choice R. R. No. 1 wrought, $17.50 to $18; machinery cast, $12.50 to $13; No. 2 light scrap (forge), $12.50 to $13; No. 2 light scrap (ordinary), $10 to $10.50; axle turnings, $10.50 to $11; wrought turnings, $9.75 to $10.25; cast borings, $7 to $7.50; stove plate, $11 to $11.50; wrought iron pipe, $12 to $12.50.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, NO. 150 NASSAU ST., May 10.

The contracts for the Pennsylvania tunnel castings and cast screw piles, which were signed on May 6, and which were placed with the Wheeling Mold & Foundry Co., of Wheeling, W. Va., and the New York Car Wheel Co., of Buffalo, N. Y., were a leading topic for gossip during the week. It is said that the prices ranged from $25 to $26 per net ton. Deliveries will not be made before 1905. The contracts for the castings

that will be needed for the East River section of the tunnel will be placed ere long, and it is said that some definite news on the matter may be obtainable in the next two weeks. The two successful bidders above named divide between them 52,000 tons of castings and 12,000 tons of screw piles..

Yesterday trading in warrants of the American Pig Iron Storage Warrant Co. was begun on the Metal Exchange in this city. Warrant trading was abandoned several years ago when stocks disappeared. Stocks in yards on April 30, 1904, were 73,700 tons, against 69,700 tons on March 31, 1904. Business is to be done in Southern irons only for the time being, and these are quoted at $9.25 to $9.50 for spot and May, and $9 to $9.50 for June and July, the basis for all contracts being Southern No. 2 foundry. The seller has the right to deliver all brands on the following basis: No. 1 foundry, deliverable at 50c above No. 2; No. 1 soft, at 50c above No. 2; No. 2 soft, as equal to No. 2; No. 3 foundry, at 50c below No. 2; No. 4 foundry, at 75c below No. 2; gray forge, at $1 below No. 2. It is the intention of the company to extend its yards throughout the country, and eventually Northern irons will be traded in. At present all the company's yards for coke iron are in the South.

Pig Iron.—It would be difficult to find a more lifeless situation than that of the past week. Sales agents say it is almost a waste of time to try to obtain orders, for consumers have either provided for their requirements for the second quarter, or are convinced that better terms can be made by waiting. Prices for both Northern and Southern irons are 25 cents, if not 50 cents, lower than those of a week ago. The $10 Birmingham basis for Southern No. 2 foundry no longer exists. Small orders can be placed for $9.75, while on a large tonnage it appears that $9.50 is possible. The Sloss-Sheffield company is again in the market. Attempts are still being made to have this company agree upon a base price with its two leading competitors, but the chances of success are not very bright in view of Northern competition. Northern irons suffered during the week, both in price and tonnage. Complaints that there is no profit in selling iron at present prices are frequent, especially from the Lehigh Valley furnaces. Sellers are beginning to conclude that, apart from Pennsylvania tunnel and pipe works business, the remainder of the year looks to be shaping itself for hand-to-mouth-buying. New York prices for pig iron at tidewater are as follows: Northern No. 1 X, $15.25 to $15.50; No. 2 X, $14.75 to $15; No. 2 plain, $14.25 to $14.50; Southern No. 1 foundry, $13.50 to $14; No. 2 foundry, $13.25 to $13.50; No. 3 foundry, $12.75 to $13; No. 4 foundry, $12.25 to $12.50.

Finished Iron and Steel.—All branches of the finished material market were inactive during the past week. Structural shape orders closed made up only a small tonnage. Independent construction interests, in their anxiety to get business, are quoting some very low figures. Plates are very flat, the strike in the local ship yards, where the question of an open shop is involved, paralyzing everything. The mills are turning their attention to export trade. There is an inquiry out for about 400 tons from Western Peru, and some of the bids put in would mean a shade above $22 net at mill. Bars are quiet, with bids at concessions frequently heard of. In sheets dullness and low prices continue to be the rule. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.35c; sheared steel plates, tank, 1.74½c to 1.80c; flange, 1.84½c to 1.90c; firebox, ordinary, 1.94½c to 2c; refined iron bars, 1.50c to 1.55c; soft steel bars, 1.50c to 1.55c; steel sheets, in carloads, New York, No. 28 black, 2.45c to 2.50c; galvanized, 3.45c to 3.50c.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, NO. 150 NASSAU ST., May 10.

Pig Tin.—The local situation during the week was dominated by developments abroad, where heavy selling by Chinese interests brought about a considerable decline in the market both in London and here. Locally the weakness of the metal was due also to a decreased demand from consuming centers. Closing prices at the Metal Exchange today were as follows: Spot and May, 27⅛ to 27⅜c; June, 27.25 to 27.45c. London's closings today follow: Spot, £124 15s; futures, £123 15s. Arrivals at Atlantic ports for the month to date aggregate 1,370 tons, against 3,079 tons afloat.

Copper.—Although prices show no change from our previous quotations, the demand for the metal has not been as brisk as it was ten days ago. The export trade for this month has opened up very well, and is expected to make a handsome exhibit when the monthly totals are announced. In London the market suffered a decline during the week, and prices for both spot and futures are identical at this writing. Closing prices at the Metal Exchange today follow: Lake, 13⅜ to 13⅝c; electrolytic, 13⅛ to 13¼c; casting, 12⅞ to 13⅛c. London's closings today are £57 15s for both spot and futures. Exports for the month to date amount to 3,872 tons, against 2,347 tons for the same period last year.

Lead.—While prices remain at 4.60 to 4.65c, the tendency is easier. St. Louis declined to 4.35 to 4.40c. London is also lower at £11 17s 6d.

Spelter.—Is quiet and unchanged at 5.20 to 5.25c. St. Louis is weaker at 5.00c. London is unchanged at £22 7s 6d.

Antimony.—Prices are unchanged, Cookson's being 7¾c to 8c; Hallett's, 7¼c to 7½c, and other grades, 6¼c to 6½c.

Quicksilver.—We quote $45 per flask of 76½ pounds in lots of 100 flasks. London is £8 2s 6d.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c to 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, May 10.

Quietness rules in the local metal market. New business is limited to small lots for immediate needs only, while specifications against old contracts show a falling off. Prices are without material change, though pig tin is somewhat firmer. Copper is quoted at 13½c for Lake in carload lots, and 14c to 14½c for smaller lots. Casting, 13¼c for carloads, and 13¾c for smaller lots. Pig tin, 29½c to 30c, according to quantity. Spelter is selling freely at 5¼c for carloads, and 5¼c to 5½c for less than carload lots. Sheet zinc, 5.75c per lb. in car lots of 600-lb. casks, and 5.95c to 6c for less than carload lots. Pig lead, 4.45c, carloads, and 4.50c to 4.55c in lesser amounts. Antimony, 8½c to 8¾c for Cookson's, and 7¼c to 7½c for Hallett's. Nickel, 45c to 60c, according to quantity.

Old metals are weak and prices have a sagging tendency. We quote as follows: Copper wire and heavy, 11¼c; copper bottoms, 10⅛c; copper clips, 11⅛c; red brass, 10¼c; yellow brass (heavy), 8c; yellow brass borings, 6¼c; red brass borings, 8¼c; light brass, 5¾c; pipe lead, 4c; tea lead, 3.90c.

The American Car & Foundry Co. has issued the following statement of earnings for the ten months from May 1 to February 29 and their dispositions:

	1903-4	1902-3	Dec.
Net earnings	$4,172,745	$5,900,971	$1,728,226
Divs. pfd. stock, 7 percent.	2,100,000	2,100,000	.....
Balance	$2,072,745	$3,800,971	$1,728,226
Divs. on com.	900,000	1,200,000	300,000
Surplus	$1,172,745	$2,600,971	$1,428,226

The dividends for the entire year are charged above against the earnings for ten months. This year there were two quarterly dividends of 1 percent each and two quarterly dividends of ½ percent each, making 3 percent in all, paid on the common stock, against 4 percent paid in the previous year. Adding to the foregoing surplus of $1,172,745 for the ten months, the surplus at the close of the last fiscal year, ended April 30, 1903, of $10,730,454, brings the total surplus on Feb. 29, 1904, up to $11,903,139.

The first launching at the new yard of the Great Lakes Engineering Works on the river front below the River Rouge at Detroit, took place on Thursday, May 5, when the steel freighter R. W. England slipped from the ways. The England is 378 feet over all, 28 feet deep and 50 feet beam. Her capacity is 5,700 gross tons of iron ore.

LAKE SUPERIOR CO. REORGANIZATION.

The reorganization committee of the Consolidated Lake Superior Co. has given notice that the plan of reorganization dated Oct. 20, 1903, has been declared operative. The time for depositing stock of the old company and participating in the new organization by paying in $3 a share, has been extended to May 17. The new organization will be known as the Lake Superior Co. Upon the carrying out of the plan this company will become the owner of all the securities now held by Speyer & Co. These securities carry the title to all the properties of the subsidiary companies which the old Consolidated Lake Superior Co. held. All the different interests have consented to the reorganization plan, and it is expected that in a month from now the industries which have been idle at the "Soo" and in the neighboring country, will be put in operation.

Provision is made for a capitalization of $40,000,000 in stock of one class only. This will be disposed of as follows: $14,000,000, exchangeable for the $28,000,000 of preferred stock of the old company at the rate of two shares for one; $18,000,000, exchangeable for the $72,000,000 of the common stock of the old company at the rate of three shares of old for one of the new; $2,142,900 as a bonus with the first mortgage bonds, and $5,857,100 to the underwriters who have undertaken the reorganization.

The assets of the new company will consist of all the property of the old company and its subsidiary companies, a cash working capital of $1,000,000 and a large quantity of raw material and partially worked material on hand. In regard to this the committee says:

"The Canadian Improvement Co. (the underwriters) also undertakes that after all expenses, fees and commissions of the reorganization have been paid the new company to be formed shall have a clear working capital of $1,000,000 in cash over and above and exclusive of raw material and partially worked up material on hand; and it has been agreed with the Canadian Improvement Co. that if in order to provide such cash working capital it becomes necessary for the Canadian Improvement Co. to raise money in addition to the maximum amount of its underwriting obligations it shall be entitled to receive for such additional sum first mortgage bonds of the new company at the price of 70 percent of their par value. An extension time for three years has been secured on $600,000 of secured claims."

Carborundum at St. Louis.

The Carborundum Co., of Niagara Falls, N. Y., has just shipped two freight cars loaded with products to be displayed at the St. Louis Exposition. The exhibit will occupy Block No. 16 in the Machinery building, and will be one of the most elaborate ever made by the Carborundum Co. A principal feature will be a great pyramid of carborundum crystals, seven feet high and six feet in diameter at the base. The crystals are of varied shapes and colors and will produce a handsome effect when properly lighted. The balance of the exhibit will be made up of carborundum wheels, sharpening stones and other products, also samples of different work that has been made possible by the use of carborundum. The display will be in charge of William H. Arison, who had the carborundum exhibit at Buffalo, and E. W. Taylor, who was in charge of the Charleston, S. C., exhibit.

Colorado Iron Works Co., Denver, were incorporated in 1876 on a capital stock of $25,000. That charter expired, under the laws of Colorado, in 1896. The surplus was at that time some $220,000, and on reincorporation the surplus was carried over into capital stock. Important improvements were made in the plant, and the company incorporated with a capital stock of $24,000. At this time, the surplus of valuations has reached $260,000, important improvements made and a surplus again carried into capital stock on the recapitalization. The company has within a few days incorporated under the laws of Maine, in order to become a foreign corporation to Colorado, which it considers is an important advantage, in that it is enabled to do business in the Federal courts instead of in the State courts, and for other reasons. The company reports a net valuation over and above all liabilities of $500,000, substantially.

A FOREMOST INDUSTRIAL QUESTION.

The Marine Review of May 12 devotes its leading editorial under the caption "The Nation's Opportunity," to comment upon the possibilities that grow out of proper recommendations of the commission appointed by Congress to inquire into the state and the needs of the American merchant marine. Our contemporary argues that there should be no question of local interest in this important matter, or of coast against lakes. Chicago it considers an American seaport, since that city is joined to New York by 2,000 miles of fresh water. While 14 feet draught is all that the canals now afford, a 20-foot draught is considered not unreasonable to expect, and when that day comes the resulting increase of commerce will bring a great cheapening of commodities, since the waterway furnishes the cheapest known mode of conveyance—"the great roadstead which never requires the subtraction of a cent for depreciation or the expenditure of a penny for replacement."

"When one considers the volume of commerce and freight to be carried the expenditure necessary to make these canals of ocean draught is as nothing compared to the sum which has already been expended upon the great canals of the world. Here is a latent commerce which needs only to be unshackled to overrun the world. What would Manchester, Keil, or even Suez be compared with it? Suez, the most famous of them all, has not one-fourth the commerce of Sault Ste. Marie and as for Panama, which is to cost from $150,000,000 to $200,000,000, it will not for many years have more than a tenth of Sault Ste. Marie's commerce.

"In this great question of maritime development, shipping interests are, after all, only an incident. The commerce which it quickens into life is the thing. It will serve to give to the United States a proportionate share of the markets of the world to which its resources, its various industries and its population entitle it. Is there a man alive today who would dare to dream what it would mean to the United States in the contest for the world's markets if she had as many ships as Britain has, in proportion to her resources, her coast line and the number of her people? What a frightful handicap it is for a manufacturer of reapers who, in order to send his output to South America, has first to send it to Liverpool, where it may be transferred to a ship engaged in the South American trade. Moreover, the missing of the schedule of transshipment at Liverpool by even a few hours may result in a delay of weeks before another ship is secured and this in turn has actually operated to throw the reaper out of commission for a whole season. The makers of harvesters and reapers and of industries subsidiary to them in the Middle West, the agricultural interests of the inland states, the cotton growers of the South and the manufacturers of New England are all deeply concerned in this great national movement for the uplifting of the American merchant marine. The chambers of commerce, the manufacturing and financial interests of the cities of the Great Lakes as well as those of the New England and coast states should all unite to enlighten the commission that they are engaged upon one of the gravest problems that has ever confronted a body of men; that it is a problem which vitally concerns the welfare of the nation; that it is one that has not a single selfish side to it, but is projected for the benefit of all. The members of this commission should be received by the most distinguished men in the cities which they will visit.

"Whatever measure is introduced in Congress as a result of the inquiry of the merchant marine commission should be a common one. It should be broad-gauged; it should not be sectional but all-American; it should recognize that, beautifully diverse as this country is, it is the common inheritance of the American people; it should declare that the great beneficiaries of the American merchant marine are the manufacturers of New York, Pennsylvania, Ohio and Illinois and the farms of Nebraska, Iowa, Minnesota and the Dakotas; that there is no spot in this great domain of 75,000,000 people which is not interested in the American ship.

"It is to be hoped that the report of this commission will be the last word on the subject. If it is not, it will be the fault of the commission, for every opportunity will doubtless be afforded to them to point out the ailments and to provide the remedy. If the avenue to rehabilitation does not lie through direct subsidies, then let us abolish the thought of subsidies altogether; if it lies in a preferential tariff upon goods brought to the United States in American ships, then let us have preferential tariffs."

THE KEYSTONE DRILLER FOR COAL AND IRON ORE.

The Keystone Driller Co., Beaver Falls, Pa., has recently issued three important catalogues. No. 1 gives a complete illustrated description of water well machinery for all depths up to 1,000 feet, traction and non-traction. No. 2 contains illustrated descriptions of mineral prospecting and gold testing machines and appliances, with full instructions for operating, while No. 3 deals with oil well rigs. Catalogue No. 2 goes into the details of prospecting for coal or iron ore, and the accompanying illustration suggests the most modern method for proceeding after the vein of iron ore or coal has been reached. Fig. 1 shows the regular rock bit touching the coal or ore. Fig. 2 illustrates the 3-inch center drill making a three-inch hole through the vein. In Fig. 3 the shearing bit is at work, while in Fig. 4 the vacuum sand pump is clearing the hole of all cuttings. Fig. 5 shows the effect of a charge of powder which may be inserted after two tests have been made. Machines of this company are in use all over the world, and at the present time shipments are being made to South America, Africa and Russia.

Marcus Sergey Friede, an exporter of machinery, with offices at 71 Broadway, N. Y., has filed a petition in bankruptcy, with liabilities amounting to $61,954, and assets unknown. In his petition Mr. Friede states that his failure was directly due to the war between Russia and Japan. Banks are the principal creditors. Mr. Friede says that the war resulted in tying up his available assets. He has heavy accounts with the Russian government for supplies consigned to various cities in Manchuria. He has large stores of material for railway and steamship construction in warehouses in different parts of Manchuria. He hurried to Dalny last December, attempting to make collections, and then went on to Port Arthur, arriving there on Feb. 6. The next day the Japanese fleet bombarded the port. The building occupied by his business agents was struck by a shell and partly demolished. Friede and three of his employes were slightly wounded. He applied to Admiral Alexieff for permission to charter a merchant ship to remove his supplies, but his request was refused. He says that his effects have been confiscated by the Russians.

The new blast furnace of the Lookout Mountain Iron Co., Battelle, Ala., will be ready for the torch by July 1 and will be placed in commission as soon as it is finished.

Hydraulically Forged and Rolled Solid Steel Railway Wheels—II.

BY HENRIK V. VON Z. LOSS.

(Continued from issue of May 5.)

If it is of great importance to have a maximum amount of work done on the metal, it is even still more necessary to have a metal of the proper chemical composition. With this in view, inquiries were made in the engineering department of a large trunk line to ascertain which composition of tire produced the best result, realizing what was good for a tire would naturally be equally good for a solid steel wheel. The mileage of several compositions was given, and the comparison between them resulted in a metal which is our present standard, and which runs about as follows:

Carbon	about .7 percent.
Manganese	.65 to .70 percent.
Silicon	.3 percent.
Sulphur and phosphorus, both below	.05 percent.

The physical test showed an elongation of about 13 percent in 2 inches, with a contraction of about 35 to 40 percent, and an ultimate of about 125,000 pounds per square inch.

It may be of interest to know the practices in this line of foreign railways, and with that in view I have copied the following specifications from a trade catalogue published by one of the leading makers of steel tires:

ENGLISH PRACTICE.

Chemical Analysis.

Carbon	.65 to .75 percent
Silicon	.20 to .25 percent
Phosphorus	under .05 percent
Manganese	.50 to .55 percent
Sulphur	under .045 percent

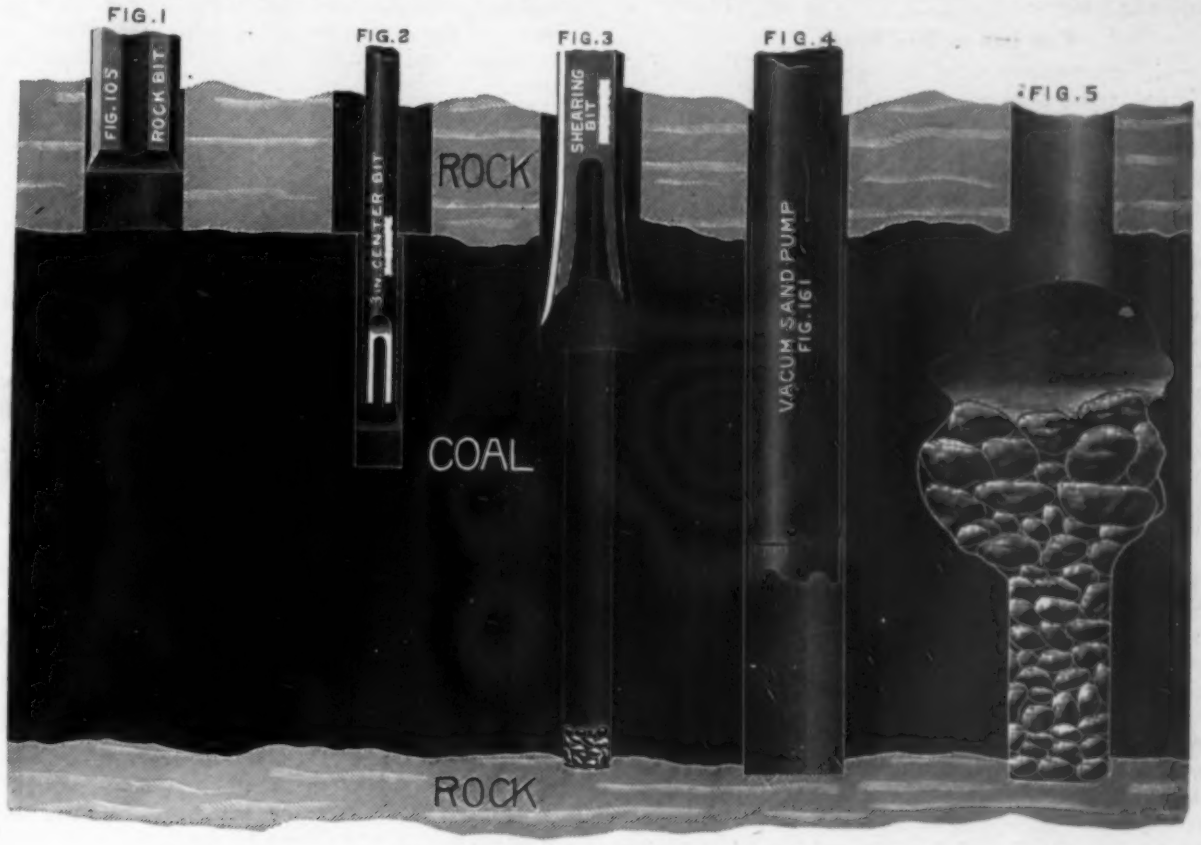
Physical Test of Steel of Above Analysis.

Tensile strength	115,000 to 125,000 pounds
Elastic limit	55,000 to 60,000 pounds
Elongation	10 to 15 percent.

RUSSIAN PRACTICE.

Chemical Analysis of Steel.

Carbon	.50 to .60 percent
Phosphorus	under .05 percent
Silicon	under .25 percent
Manganese	.50 to .70 percent
Sulphur	under .05 percent



USE OF KEYSTONE DRILLER ILLUSTRATED.

Physical Test of Steel of Above Analysis.

Tensile strength	85,000 to 100,000 pounds
Elastic limit	45,000 to 50,000 pounds
Elongation in 2 inches	17 to 22 percent.

JAPANESE PRACTICE.

Chemical Analysis of Steel.

Carbon	.55 to .65 percent
Silicon	under .20 percent
Phosphorus	under .05 percent
Manganese	.55 to .65 percent
Sulphur	under .045 percent

Physical Test from Steel of Above Analysis.

Tensile strength	100,000 to 107,500 pounds
Elastic limit	50,000 to 55,000 pounds
Contraction of area	20 to 29 percent.
Elongation in 2-inch section	15 to 18 percent.

FINLAND STATE RAILWAYS.

Chemical Analysis.

Carbon	.50 to .60 percent
Silicon	under .20 percent
Phosphorus	under .045 percent
Manganese	.50 to .60 percent
Sulphur	under 045 percent

Physical Test from Steel of Above Analysis.

Tensile strength	92,000 to 100,000 pounds
Elastic limit	46,000 to 55,000 pounds
Elongation in 8 inches	15 to 18½ percent.

Cast Iron vs. Steel Wheels.

Since the commencement of the agitation in favor of a solid forged, rolled steel wheel, the makers of the old cast-iron chilled product are brought face to face with a new innovation, and many arguments in favor of their own wheel and objections to this new one were advanced. It has been said that the introduction of the new steel wheel would force railroads to purchase and operate lathes to an extent that would be prohibitory in order to keep the steel wheel up to its standard. If the life of a steel wheel, with all its turnings, were no greater than the life of a cast iron wheel, such arguments would be true. But if the time between the turnings of the steel wheel represents a mileage equal to that of a cast iron wheel—and which it should do—there would be no more dismantlings than what at present exist in ordinary car practice.

The above statement is based upon cast wheel mileages of 70,000; but, as previously mentioned, the experience of at least one of the great trunk lines has cut this figure down to from 30,000 to 40,000 miles when operated in connection with the 100,000-pound cars, and in such a light the dismantlings for the steel wheel are of still less importance. It has also been argued that good cast iron represents a metal for wheel purposes which is superior to steel, as it flakes less and, barring the question of strength, is a better all round metal when provided with a chilled rim.

I am not here to belittle the merits of the cast iron wheel; on the contrary, its introduction, with its many magnificent qualities, enabled industrial progress to an untold degree; but, unfortunately, as competition became greater less care was used in the selection of the iron, and instead of having a metal of charcoal material, with an ultimate resistance of from 30,000 to 33,000 pounds, the wheels of to-day are made of iron ranging between 20,000 and 22,000, and at times hardly that. Such is the fact independent of any theory, and it is with this low grade wheel that we have to deal.

I do not deny that it may properly be asked: If a better cast iron were substituted, what would be the result? The most pertinent reply that can be given to this query is, that all would have been well and the steel wheel would not have become a necessity, if the world had not seen the introduction of the steel car. It goes without saying that when frogs and switches actually prohibit the increase of dimensions only one other alternative exists, namely: increase of tensile strength; and this last step in the evolution of the car wheel became, hence, a necessity and, as I also trust, has now become an accomplished fact.

Barring the records of individual railways, no concerted action has been taken in this country to keep and maintain a national record of the life and accidents to railway wheels. In Germany, however, an association was formed about ten to fifteen years ago which included the German State Railways, the Austrian-Hungarian State Railways and a few other independent roads. This association has taken a great deal of care in the matter of wheels, comparing damages to different constructions as well as to different metals. There are, of course, no rolled steel wheels in their territory; but a number of cars, with a few locomotives and tenders, have been equipped with solid cast steel wheels, and it is interesting to note the results, though their number is somewhat too small to form very conclusive opinions as to details.

During the years 1887 to 1896, the total number of tired wheels varied from 1,700,000 to 2,300,000, while the total number of solid steel wheels commenced at 340,000 and increased to 375,000, most of which latter were, as already mentioned, placed under cars generally carrying freight. It was found that the percentage of loss—this includes cracks and fractures—in the steel-tired wheels was about .18 percent in 1892, increasing up to .22 percent in 1894 and 1895, while with the solid steel wheels during the same period, the total loss was about one-half of 1 percent. In steel-tired wheels the relation of cracks to fractures was about 7 to 10, while with solid wheels the fractures were so rare that as a matter of comparison they can be ignored.

The above indicates clearly, from a point of general result, the superiority of the forged and rolled rim as compared to that of the coarse, crystalline cast metal. The German report furnished some data on the question of temperature which may be of interest to our profession in this country.

The total damage done to steel-tired wheels during any one summer month, as compared to the month of January, is one to ten. This heavy mid-winer destruction lasts only for a short time, reaching its maximum during the month of January, while during the five summer months the minimum will remain practically constant. With solid steel wheels this relation was as one to four, showing the beneficial result of a solid web.

The German data indicated that the maximum damage was done with heavy tires, which I naturally suppose means that if a tire is imperfect the defects will develop shortly upon the wheel being placed upon the road. Illustrating this point, the following figures give a very interesting summary (the total damage done being considered as 100 percent, including fractures and cracks, and the wheels representing the sum of both types, cast steel as well as tired).

Six percent of all the damage was done on mileages above 190,000; 30 percent was done on mileages between 100,000 and 190,000; 23 percent was done on mileages between 70,000 and 100,000, and 25 percent was done on mileages between 35,000 and 70,000.

The lessons derived from the above data, and as taught us by our German fellow engineers, would certainly seem to warrant us in drawing the conclusion that the solid forged and rolled steel wheel would have a rim which should possess very many of the meritorious qualifications of the steel tire, coupled with the advantages and the inherent strength afforded and shown by the web of the solid cast steel structure.

In the history of the world industrial progress has been emphasized by certain landmarks, and I believe that among these epoch-making events those that refer to transportation on water or land are the greatest of all.

A few years ago, at a festive gathering of a number of remarkably able men, the question arose as to the relative importance, financially, industrially as well as ethically, of the leading inventions and discoveries recorded in the annals of history. The mariner's compass, the printing press, the steam engine, the laws for movement of matter, the discovery of the blood circulation, the anæsthetics, etc., were all reported in due order. The host, who was president of one of the greatest trunk lines of the world, remained silent. Finally, when one of his guests addressed him with a request to mention *his* choice amongst the great meritorious facts, his answer was prompt—"the flange of a car wheel."

Discussion.

A. FALKENAU—I should like to know from Mr. Loss of what kind of material the punches are made.

MR. LOSS—After a number of experiments we decided

in favor of fairly hard cast-iron as possessing the best average combination of durability and cheapness.

W. VOLLMER—I should like to ask Mr. Loss about the number of wheels at present in service. Also about their length of service and the mileage covered as well as their general efficiency.

MR. LOSS—Last June about thirty experimental wheels were placed under locomotive tenders on different railways and for different purposes. Fast express trains, accommodation passenger trains (some of these latter running on mountain roads) and heavy freight were all included. From 25,000 to 35,000 miles, depending upon the character of service, was the average mileage before turning, and the general wear as taken from plaster casts was very good. The master mechanics handling the wheels have informed me that their behavior on the road or in the lathe in the machine shop was the same as that of an ordinary steel-tired wheel. We have lately started our works in Pittsburg, and during the last month from 900 to 1,200 additional wheels have been shipped and are daily being placed on the different roads.

E. B. HALSEY—What is the percentage of carbon used in the steel, and do you start from a blank or from blocks of steel cut from the ingot?

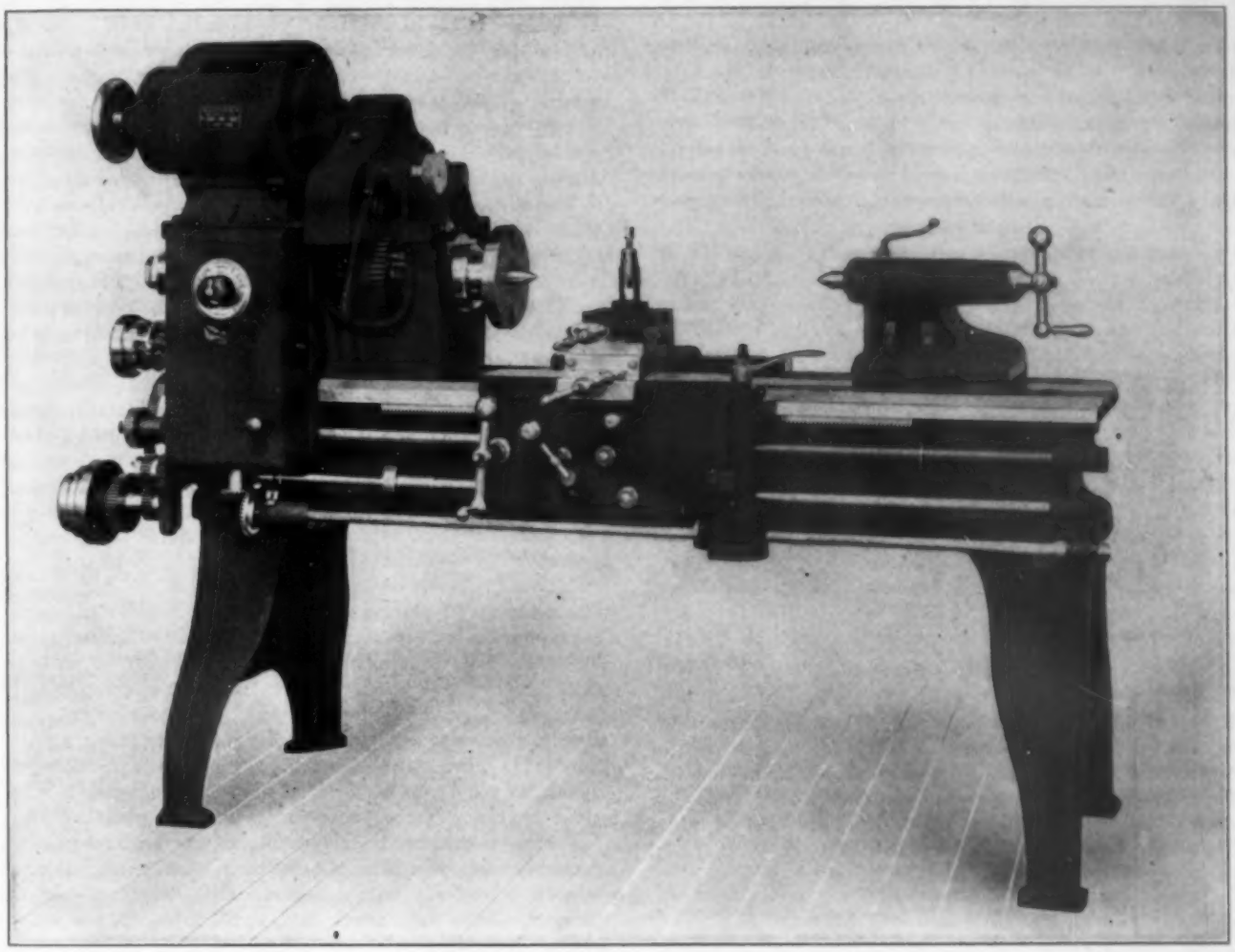
MR. LOSS—The percentage of carbon is about .70, and the ingots are, as previously described, at present run separately. They are round, with varying thicknesses, and there is no doubt but what we shall shortly run them in multiples. Not being a mere steel casting, we use no sink-heads, but fall back upon the great pressures exerted upon the metal in the two presses and the rolling mill to solidify it. The pressure on the rim while rolled is equal to that existing in the largest tire-mill of today. The microscopic photographs show how well we have succeeded. It must be added, however, that a great deal of time and expense were bestowed on the subject of how to cast the ingots, resulting in the adoption of some very interesting methods. Our uniformity in product has been greatly advanced by this knowledge.

NEW 16-INCH ENGINE LATHE.

The illustration presents the new 16-inch swing engine lathe manufactured by the F. E. Reed Co., of Worcester, Mass. The lathe is equipped with a direct connected variable speed electric motor. The motor shown is a Storey Mohawk motor made by the Magneto Electric Co., of Amsterdam, N. Y., but the lathe builders are of course prepared to supply these machines with similar variable speed motors made by other manufacturers, should these be preferred. The motor drive equipment includes an excellent controller.

The motor seen on this lathe is 1 h. p. and of 110 volts, but may be furnished of any desired voltage. The speed variations range from 630 up to 2,140, by about 300 percent. There are four gear ratios, as follows: First gear ratio gives spindle revolutions per minute from 700 to 200; the second gear ratio gives spindle revolutions per minute from 238 to 70; the first gear ratio with back gears gives spindle revolutions per minute from 80 to 24 and the second gear ratio with back gears gives spindle revolutions per minute from 27 to 7¾.

Teh above spindle revolutions of 700 down to 7¾ admit of suitable speeds for cutting at the rate of 35 feet up to 200 feet per minute within the limits of the lathe as to feeds and speeds. These motors have been subject to tests which have shown a development of about 2½ h. p. without sparking or other detrimental features. The machine represents the standard type of construction for the firm's direct connected variable speed motor driven engine lathes and the builder is prepared to supply other sizes of engine lathes with this motor drive. The machine so equipped has been subjected to exhaustive tests by experts from some of the largest electrical concerns and has passed a successful series of trials.



NEW 16-INCH ENGINE LATHE.

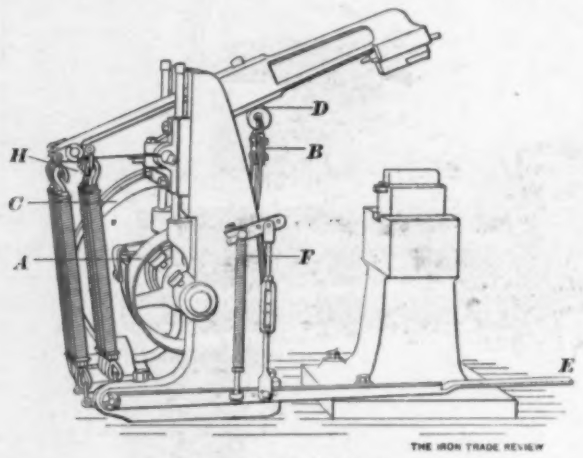
The F. E. Reed Co. has one of these lathes equipped in this manner among its eight lathes on exhibition at the Louisiana Purchase Exposition. The lathes may be found in the Palace of Machinery, Block 9, corner of aisles H and 3. There will be a competent attendant there during Exposition hours; the tool is wired to a supply of electric current and may be seen in operation. A 10-inch special, manual training, wood working lathe of the same make is in Section 8 of the Palace of Education. This lathe forms part of the exhibit of the Colleges of Agriculture and Mechanic Arts and Experiment Stations, and is the only lathe exhibited at the latter place.

A NEW POWER HAMMER.

A description of a new power hammer is sent from Chemnitz, Germany, by U. S. Consul Monaghan. The principle upon which the design is founded will be familiar to the mechanic as that followed in the usual type of drop press. The article says: "The hammer is made to descend by means of the friction resulting from the contact of the disk *A*, which is put in motion by the wheel *C* driven by a belt, with the belt *B* attached at one end to the hammer at the point *D* and at the other at the pedal *E*. This pedal is worked by the foot and the strength of the stroke depends on the way the foot is put down. When freed the pedal is drawn back to original position by means of spring *F*. The springs *H* serve to draw the hammer back to its original position. The hammer is also arranged so that it can be set at angles to the anvil. The speed of the hammer is about 100 heavy or 200 light strokes per minute. The price is very low, as the construction is so simple, thus leaving repairs almost out of the question."

Berger Manufacturing Co.'s Exhibit at St. Louis.

The booth of the Berger Mfg. Co., of Canton, O., at the St. Louis Exposition is located in the varied industries building, block 9, and is in the care of Walter W. Stevens. The booth is entirely of metal and was produced in its entirety in the shops of the Berger Mfg. Co. It is in the Doric style of architecture, with columns and appropriate capitals. The interior is handsomely finished in ivory white and the columns in imitation of Italian marble, with the capitals in silver. The general



A NEW POWER HAMMER.

purpose of the interior finish is to set off the harmonious decorative possibilities in colors secured through the use of Berger's classified designs in metal ceilings and sidewalls. The extensive line of sheet-metal products of this firm are shown in the booth, including a line from the steel furniture department, showing up-to-date construction.

The directors of the Shelby Iron Co., which has furnaces at Shelby, Ala., making 40,000 tons of car wheel pig iron per annum, have decided to discontinue dividends on the $1,000,000 capital of the company. An official of the company stated that it had ample funds on hand to pay the dividend, but, as the market was slow and the company had a good amount of iron on hand, for which there was comparatively little sale, the directors thought it would be the better policy not to pay the dividends. The company has declared its dividends at irregular rates since its organization in 1890 and the past five years has paid on an average 13½ percent annually.

President W. L. Brown, of the American Shipbuilding Co., has announced that with the completion this week of the passenger steamer Missouri, work at the South Chicago plant of the company will be cleaned up and the plant will be closed except for repair work.

The American Car & Foundry Co. has issued the following statement of earnings for the ten months from May 1 to February 29 and their dispositions:

U. S. STEEL BOND SYNDICATE DISSOLVED.

J. P. Morgan & Co., as managers of the United States Steel Corporation preferred stock conversion syndicate, have made formal announcement that it will be dissolved on May 17. The announcement took the form of a circular letter which was sent to every member of the syndicate. The letter, which, of course, varies as to figures, acording to the subscription of the individual, is given below as applying to a subscriber for $3,750 of bonds:

Referring to our circular letter of Sept. 14, 1903, we beg to inform you that we shall be prepared to close the syndicate account on May 17, 1904. Your subscription to the syndicate was for $3,750 bonds, of which 80 percent was payable in preferred stock and 20 percent in cash, at par and interest. Having delivered to you on Oct. 1, 1903, a portion of the bonds payable in preferred stock, there remains still to be dleivered to you the balance of such bonds, amounting to $1,000 ex-matured coupons, accounted below: On Oct. 1, 1903, we called from you 25 percent of your cash subscription, leaving still due from you 75 percent of such cash subscription, which, with accrued interest to May 17, amounts to $564.18. Your share of the amount standing to the credit of the syndicate May 17, 1904, including interest at 5 percent per annum on the portion of cash subscription paid Oct. 1, 1903, will be $325.50, to which is added the amount of coupons due Nov. 2, 1903 (seven months) and May 1, 1904, on the undelivered portion of bonds payable in preferred stock mentioned above, making the total $379.68. This leaves a balance due from you in final settlement of $184.50, for which kindly handle us your check on Tuesday, May 17, 1904, upon receipt of which and upon the surrender of your certificate of participation properly indorsed we shall be prepared to deliver to you all the bonds subscribed for by you in cash, together with the balance of the bonds payable in preferred stock as stated above, making total delivery to you at that time of $1,750 bonds. Fractional amount of bonds will be adjusted in cash.

Various estimates as to how much the syndicate lost have been compiled. While it is impossible to determine the matter accurately, the opinion on Wall street is that the syndicate lost about $10,150,000. This conclusion is based on the following calculation:

The syndicate pays in 80,000,000 preferred stock costing, say at 95	$76,000,000
Cash	20,000,000
Total	$96,000,000
The syndicate receives 100 millions 5 percent bonds worth say 75	75,000,000
Gross loss	$21,000,000
Less commissions and trading profits amounting to about	10,850,000
Net loss about	$10,150,000

The uncertain factor is the cost to the syndicate of the preferred stock bought in the market for conversion, also the amount it realized on the bonds it has been selling on a generally declining market.

The syndicate was formed in the spring of 1902 to convert $200,000,000 of preferred stock into 5 percent bonds and to market $50,000,000 of 5 percent bonds to provide working capital. As the interest on $250,000,000 second mortgage bonds at 5 percent would equal $12,500,000 per year and the dividends on $200,000,000 of preferred stock at 7 percent would be $14,000,000, it was figured that there would be a saving of $1,500,000 per year, besides securing $40,000,000 in cash, the commission being 4 percent; but the plan was not fully carried out. Last November, it was decided to make no conversion beyond $150,000,000. Only $20,000,000 of new bonds have been sold.

At the sale of the works of the Structural Steel Car Co., of Canton, O., by the trustee in bankruptcy, W. C. Laiblin, acting for the Canton Bridge Co., a creditor, purchased the building and real estate for $29,253 and C. E. Thomas, of the Cleveland Punch & Shear Works, has bid in the machinery of the plant for $6,851. It is understood that the Canton Bridge Co. expects to sell the plant.

SPECIFICATIONS FOR CAST IRON AND FINISHED CASTINGS.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, communicates to the secretary of the American Institute of Mining Engineers the following discussion on his paper read before the Atlantic City meeting of the institute, being largely in reply to points brought out in the discussion at the meeting:

In following the discussion on the specifications for cast iron and finished castings, I was strongly impressed with two points which might be ventilated to advantage more fully from the view of the practical foundryman. First, the reasons why only silicon and sulphur were specified and not phosphorus, manganese and carbon; and second, why but little was said concerning the presence or iron oxide in the material. With regard to the first point, the modern foundryman always demands a full analysis of the pig iron on which he is figuring with the seller; yet, when the order is placed, only the silicon and sulphur contents of the pig iron are of importance.

Concerning the presence of phosphorus, all the pig iron made for foundry purposes is divided into three classes, namely, containing less than 0.4 percent; between 0.4 and 0.8 percent, and more than 0.8 percent. In all of these three classes a choice is to be had of the silicon and sulphur contents. The pig irons containing the lowest ranges of phosphorus will be used for making special grades of gun iron, car wheels and specification castings; and to the foundryman it is immaterial whether the phosphorus present is a mere trace or 0.4 percent, provided it be not above the latter limit. If ordinary classes of jobbing work, machinery and gray iron castings in general, pig iron containing the medium percentage of phosphorus is desired, and in this case also it is not important whether the phosphorus content be at the upper or at the lower limit, provided it does not go beyond either. Finally, for art work, stoves and novelty castings, or those in which great fluidity of the metal is required, the high range in phosphorus is selected, and it matters little how high this range is, for the reason that any great discrepancy will be adjusted by proper mixing before melting. Furthermore, the customs of the trade are such that no pig iron merchant would think of selling a high phosphorus pig iron to the maker of boiler castings, which are tested under pressure, and, therefore, might endanger life. The stove manufacturers have learned to use certain pig irons high in phosphorus and would not think of going outside of this class of metal; consequently, the element phosphorus is not so all-important in foundry practice as it is in making steel; and, as a result, it was not deemed necessary to burden the general specifications for the sale of pig iron with the phosphorus requirements.

A similar condition of affairs exists with regard to the quantity of manganese present in pig iron. In this case there are two classes of metal; the line of division being 0.8 percent of manganese. Pig irons containing a percentage of manganese less than 0.8 percent are valuable for making ordinary foundry castings; while those pig irons exceeding 0.8 percent manganese will be sought for making special castings on account of their high manganese content.

The founder, in glancing over the analyses presented by the agents of the various pig iron manufacturers, will at once remove from all consideration those furnaces which make iron too high or too low in phosphorus, or too high in manganese for his use, and his selection will be made from the rest according to the silicon and sulphur contents of the metal.

Finally, as to the carbon, if anything, the foundryman reduces the quantity present in the pig iron by the addition of scrap-steel in the melting process. Therefore, but little attention is paid to the total carbon content of American pig irons, which is almost invariably present in proper proportion. For special castings, however, which require undue softness, a high percentage of total carbon is sought. A pig iron containing a carbon content below the normal arouses suspicion, and indicates that something has been wrong at the furnace. If an occasional specification is seen asking for a given percentage of total carbon, it is probably necessary for a given purpose. On the other hand, a specification (and I have seen several) demanding more than a given minimum of graphite is an evidence of ignorance, and the furnaceman can only hope that some day the maker of a specification of this kind will learn more of foundry metallurgy and withdraw the useless and objectionable requirement.

Taking up the second point of importance—the oxidation of the metal—the lengthy discussion of this subject which took place at the Atlantic City meeting showed that this expression was understood to be the absorption of oxygen from the blast, leaving it in the iron as occluded gas. This effect is not strictly that with which the foundryman has to contend. He is troubled with an actual dissolved iron oxide, and knows that no matter what melting process he uses, the quantity of this objectionable constituent is sure to be increased at every melting.

The steel man is comparatively free from this trouble, because he uses much higher temperatures, and simply adds ferro-manganese to remove at once any oxidation products in the bath of metal. Suppose the blow of the converter were interrupted at a point where some silicon still remained in the metal, and the metal was then cast into molds, gases would be liberated and a weak product would result.

After all, any foundry melting process is similar to the converter process, excepting that the blast pressure is less, the time of action longer, and no attempt is made to refine the metal. The air furnace with a top blast used in the malleable iron process is practically a converter with a top blast, instead of one at the bottom or side.

It is my belief that the difference in excellence between cold blast charcoal iron, warm blast charcoal iron, and hot blast coke iron, all of like composition, lies solely in the degree of freedom from oxidation of the metal as it flows from the furnace spout. Foundrymen instinctively realize this effect, and in making special castings the utmost care is taken to get pig irons which will yield castings of the best service qualities, the composition being constant. Even in the malleable iron industry, no one who has to make "specification castings" (especially good work), would think of using straight Bessemer pig iron for this purpose, even though the chemical composition meets the requirements. The selection will be "Bessemer malleable," or pig irons with an analysis practically within the Bessemer limit for sulphur, and made of better quality, especially with the aim to avoid weakness, which really means oxidation. I have repeatedly used ordinary "Bessemer" in making malleable castings, with the result that the tensile strength was much below the average. As a result of this experience, I used the pig iron only from those blast furnaces which look after these matters more closely and make a more satisfactory product.

What the foundryman fears most, in using the open-hearth furnace for his work, is the occasional rising of pieces of the furnace bottom which are saturated with burnt iron, and oxidation products. These pieces float on the surface of the bath of metal and gradually yield to it the iron oxide contained, with the result that the metal in the bath, though of proper chemical composition, loses its life as soon as tapped, and "skulls" everything into which it flows.

Foundrymen know that the pig iron they use, be it as good as it can be made, is never improved in the melting. Even the best of them would be glad to do better work, if they knew how to do it. The most pressing need at present is the assurance that they are getting the best pig iron that can be made for a given composition, and that the blast furnaces also are trying continually to improve their work. If both foundryman and furnaceman will keep this improvement always in mind, there is nothing to fear for the future, and in time we may be able to correct irregularities which are now beyond our knowledge.

Receiver M. N. Cecil, who has had charge of the property of the Heating, Ventilating & Foundry Co., which is located at Elm Grove, W. Va., has shut down the plant and recommended to the court that the property be sold at auction. He reports that the liabilities amount to $23,496 and the assets to $5,562.

W. H. Schofield, formerly president of the Steel Wheel & Wagon Co., Pueblo, Col., has been appointed manager of the Western department of the McGuire-Cummings Mfg. Co., with headquarters at Kansas City.

A TRAVELING MACHINE SHOP.

The success of the repair ship Vulcan, of the United States Navy in the Spanish-American war, suggested to the engineers of Morgan Construction Co., of Worcester, Mass., the use of a freight car properly equipped for a portable machine shop. In the erection of rolling mill plants it has frequently been found necessary to have on the ground several machine tools with some means for operation on which to do the small jobs of fitting and operation which cause so much delay if the parts have to be sent to a machine shop. The expense of installing tools and the depreciation on account of exposure was very excessive, and the machine shop car has proved to be a great success. It is sent to a plant whenever the erection is to begin and remains there on a siding ready for immediate use until the work has been finished when it is despatched to the next field of operations. The car itself is an 80,000-lb. capacity box car with standard inside dimensions of 8 ft. 6 in. x 36 ft. and was made by the Laconia Car Co., of Laconia, N. H. It was fitted up, however, entirely by Morgan Construction Co.

The windows are somewhat embedded in the sides of the car. This was done in order that the wooden sections removed might be replaced over the windows as protection for the glass while the car is in transit or not in use. The locations of the windows are shown in Fig. 1. In Fig. 2 is given a view of the inside of the car looking towards the end containing the machinery. The motive power is obtained from an 8-h. p. Walrath gasoline engine. One of the difficulties of using a gasoline engine in such a small place where a forge and combustible material would often be used, was to locate the gasoline supply tank where there would be no danger of explosion. This was overcome by bolting the gasoline supply tank underneath the car. This tank has a capacity of 74 gallons. For cooling the engine cylinder, a 300-gallon water tank was placed inside the car as seen in the right hand corner of cut No. 2. The exhaust muffler is bolted underneath the car. The engine is connected to the shaft by means of a belt running on a clutch pulley so that the power may be shut off at any time without stopping the engine. The main line of shafting is 1 15-16 inch diameter and 15 feet 3 inches long.

FIG. 1.—MACHINE SHOP CAR READY TO TRAVEL.

The car is equipped with a 20-inch Reed lathe, an 18-inch stroke Stockbridge shaper, a Norton emery wheel grinder, a Champion Blower Co.'s forge No. 401, an anvil and a good sized work bench. It also has all the necessary auxiliary tools for these machines. There is wiring for lighting by electricity, the current being taken from the nearest point where electricity is available and acetylene lamps are provided for use when electricity is not to be had. Steam pipes for heating purposes are run along the side of the car, the steam also being taken from the nearest convenient supply.

Fig. 3 shows a view of the end of the car in which a section has been reserved as an office for the superintendent of erection. In this office are a roll top desk and chair and a cabinet where blue prints and drawings are filed. A sink and toilet case with mirror complete the equipment. There can also be seen at this end of the car a rack where tools, bolts and supplies are kept. This car is entirely complete with all necessary tools, lubricants, supplies and, in fact, all ordinary items that a machine shop is likely to require. It has been found of much practical value in field work, saving the superintendent of erection much time, trouble and traveling when machine work is required without delay.

Electrolytic Iron.*

BY C. F. BURGESS AND CARL HAMBUECHEN.

A great deal of attention has been devoted of late to the application of electrical energy to the metallurgy of iron and some of the results attained seem to point to developments of industrial importance. Most of the attempts to apply electrical energy have been through its transformation into heat for use in various smelting and reduction processes. That the electrolytic as well as the electro-thermal effect might be utilized inudstrially does not seem to have been considered seriously, as it has been commonly held that the difficulties inherent in the deposition of iron are such as to preclude its playing an important part in the industrial electro-metallurgy of this element. It has, however, been shown as a result of recent experimental work carried on in the laboratory of applied electrochemistry at the University of Wisconsin that electrolytic iron can be produced in such quantities and at such cost as to make it a materia: of commercial as well as of scientific importance, should sufficient demand for it arise.

A survey of available literature on the subject of electrolytic iron leads naturally to the assumption that its deposition is difficult to accomplish and that there are few solutions from which it can be deposited. Moreover, it has been held that a satisfactory quality of deposit can be attained only by the use of very low current densities and an exceedingly slow rate of deposition. Practically the only uses to which electrolytic iron has been put are in the so-called steel facing of dies and electrotypes and as a material for investigating the properties of the pure metal. The hardness of electrolytic iron which makes it especially suited to the facing of electrotypes is due to the occluded hydrogen which is practically the only impurity present. In fact, the term "electrolytic iron" is commonly assumed to be synonymous with "pure iron." In just what manner the hydrogen is held by the metal is a matter of doubt, it being claimed by some that it is simply condensed and by others that it forms a definite hydride. Such iron may contain this gas in quantities equal to several hundred times the volume of the metal, and it can be almost entirely freed from it by heating. Certain investigators have found that electrolytic iron contains carbon in appreciable quantities, while others have found that carbon is absent.

Dr. John A. Mathews ("Alloy Steels" in Mineral Industry for 1902) states that "pure iron may properly be classed among the 'rare metals'; thousands of tons of iron alloyed with impurities from a fraction of 1 percent, upward, are produced annually, but not a pound of iron in its pure elemental condition has ever been made under ordinary smelting conditions. By 'pure' we mean in a condition comparable with that in which the precious metals are produced or as pure as the best electrolytic copper and nickel. * * * Just as pure iron is a chemical curiosity so also is an alloy containing only iron and carbon. In practice at least four other solid elements occur fortuitously in all steels, viz. manganese, silicon, sulphur and phosphorus."

Something over two years ago the authors of this paper undertook an experimental investigation of the conditions

*Read at the Washington meeting of the American Electro-chemical Society, April, 1904.

for electrolytically depositing iron and this work has proceeded almost without interruption since that time. The primary object of the investigation was to produce, if possible, pure iron in such quantities and at such cost as to make it an available material for further inquiry into its properties. Since our attention has been confined almost exclusively to this phase of the problem the observations which have been made as to the physical and chemical properties of the product are by no means exhaustive and indeed are considered only as preliminary to a more extensive research which it is hoped to take up in the future.

The preliminary work consisted in testing the various electrolyte materials which had been suggested previously and from these the most promising were selected as the basis for further trial. It is needless to record here the many hundreds of tests which were made, for most of them were unsuccessful. Nor is it necessary to recite the difficulties encountered. The investigation was necessarily a slow one, since many of the trials required days and even weeks of operation before conclusions could be drawn as to their success. A large number of iron salts were used and the effects of variations of densities of solutions, current densities, temperature, agitation of electrolyte and various other vactors were noted. As a result of such observation, ferrous sulphate with a certain percentage of ammonium sulphate was chosen as affording the most satisfactory results, and the process as it is now being operated on a small experimental scale may be briefly described as follows: Electrolyte consists of ferrous and ammonium sulphates; the current density at the cathode is 6 to 10 amperes per square foot of cathode surface, and at the anode slightly less; the electro-motive force for each cell is slightly under one volt; the temperature of the electrolyte is about 30 degrees C.; the anodes consist of ordinary grades of wrought iron and steel; the starting sheets for the cathodes are thin sheet iron previously cleaned of rust and scale.

One of the most serious difficulties encountered was in obtaining a thick deposit of iron. While it was proved that there is a considerable range of conditions under which iron can be deposited uniformly and densely for a few hours, or perhaps for a few days, it was almost found that the surface would become so rough or pitted, or that such a rapid treeing would take place, or that the deposit would curl up to such a degree that it was necessary to discontinue the experiment and start a new one under different conditions. But improvements have been gradually effected until at the present time it is possible to continue the run four weeks without replacing the cathodes. At the end of such time the cathode reaches an average thickness of about three-quarters of an inch and the surface is so rough and nodular that it is not considered desirable to continue the deposition further. The current efficiency of deposition is very closely 100 percent; that is, there is a deposition of about one gram per ampere-hour. The electromotive force being one volt, gives about 22 pounds of iron per kilowatt-hour.

Since all the factors which go to make up the cost of large scale production cannot be accurately determined from a small scale experiment, it is impossible to state from our investigations what would be the cost of working on an industrial scale. For the past six months three tanks have been kept in almost continuous operation, these tanks having the dimensions 8 feet wide by 13 feet long by 15 feet deep and containing two anodes and one cathode. The finished cathodes from these tanks weigh about 20 pounds and constitute, perhaps, the largest pieces of electrolytic iron which, up to the present time, have been produced. The total amount of the material which has been produced from all of our experiments is about one-half ton.

A run of two months' duration was made to determine the extent of the deterioration of the electrolyte, resulting in the conclusion that the solution can be kept in good working condition with little trouble or expense. It would appear, therefore, that the cost of refining, aside from fixed charges on the plant and with power at $30.00 per kilowatt-year, would be under one-half cent per pound of iron, thus placing it not greatly in excess of the cost of refining copper.

Even with these figures realized, whether or not electrolytic iron can be profitably produced depends upon the uses which can be made of the refined metal. These in turn depend upon its properties, the most striking of which is its purity. Although our work was directed toward the production of electrolytic iron in a dense and massive condition rather than in a high degree of purity, analyses which have been made show the purity to be in excess of 99.9 percent. Not a trace of carbon was detected and silicon, manganese and other impurities commonly found in iron appear to be absent. The

FIG. 2.—GASOLINE ENGINE AND MACHINERY.

only impurity which has been detected in hydrogen, which is present in appreciable quantities in the metal as taken from the electrolytic tanks. This gaseous element in its physical or chemical combination with iron influences, in a most striking manner, the physical properties of the metal. The hydrogen can be driven off almost completely if not entirely by heating to a white heat, the evolution commencing at a temperature below 100 degrees C. and becoming rapid at a temperature below a red heat. Electrolytic iron heated in a Thomson welder, or even in a Bunsen burner has been observed to give off hydrogen so rapidly that it ignites and continues to burn after removing the source of heat presenting an appearance similar to that which would be produced by dipping the iron in alcohol and igniting it. The metal containing the hydrogen is so hard that it can be filed or sawed only with difficulty and is so brittle that it is readily shattered by a sharp blow from a hammer. After the expulsion of the gas it

becomes softer and after having been raised to a welding temperature it assumes properties of malleability and toughness similar to those of Swedish iron.

The iron when heated in a forge fire can be readily welded and forged into any desired shape and various test samples were made in this way. During such working, however, impurities are introduced, analysis invariably showing the presence of a very small percentage of carbon. The cathodes three-fourths of an inch in thickness have a surface so rough that they cannot be rolled satisfactorily into sheets, though it is possible that improvements can yet be made in this respect which will enable smooth surfaces to be obtained. The deposit adheres so loosely to the at ting sheets that it can be removed readily.

A considerable amount of work has been expended in the attempt to melt electrolytic iron without at the same time introducing impurities. The difficulties which lie in the way of doing this, however, are great on account of the high temperatures necessary and the affinity which the iron at such temperature has for many of the elements. The melting temperature of the pure iron seems to lie closely to that of pure platinum, though actual values have not as yet been determined, from lack of suitable measuring instruments. Various forms of electric furnaces have been constructed for melting the metal, a furnace of the inductor type appearing to be the most suitable for preventing the introduction of carbon. Results which have been somewhat satisfactory have been obtained by heating a molten electrolyte between graphite electrodes to a suitable temperature and introducing the metal into such molten bath. The metal thus produced is tough and malleable, while it also has a fracture of coarse, crystalline nature. The affinity which the iron has for carbon is shown by the fact that it can be readily melted in a graphite crucible while a silica crucible heated to a considerably higher degree melts before the iron in it begins to flow. The absorption of the carbon in the former case produces a fusible alloy of iron.

FIG. 2.—VIEW LOOKING TOWARD OFFICE AND TOOL RACKS.

Experiments have shown that the hysteresis, permeability and electric resistance of electrolytic iron are greatly influenced by the amount of hydrogen in it. An iron ring was deposited in such form that a hysteresis and permeability loop could be determined by the Ewing method. It was found that by heating in boiling water the hysteresis was lowered several hundred percent. By further heating in an oil bath to 200 degrees C. the value was decreased still further, but to a smaller degree than in the first heating, and upon attempting to heat it to 500 degrees, the ring cracked and the experiment was therefore interrupted. Certain samples of forged iron have shown permeability values equaling or even exceeding those of the highest permeability standard samples of Swedish iron. Other samples prepared under apparently identical conditions showed much poorer results, so that it is impossible as yet to draw definite conclusions as to the magnetic properties of electrolytic iron.

It having been shown that it is possible to produce electrolytic iron at a small cost, the question naturally asises as to what uses there may be for it. The first suggestion which naturally presents itself is that on account of its purity it should serve as a basis for iinvestigating the properties of iron and its alloys. Investigations having for their object the determination of the influence of various elements alloyed with iron as regards its electrical properties have been unsatisfactory on account of the presence of other impurities which modify or mask the effect of the element which it is desired to study. Starting with the pure iron, therefore, alloys of a predetermined and definite composition can be produced, thus making the investigations of greater simplicity. Unless the difficulties encountered in the working of electrolytic iron on account of its roughness offer too serious an objection, it should compete favorably with the pure grades of commercial iron which are used for various purposes, and which sell for 3 cents and upwards per pound.

Electrolytic iron naturally offers the means of manufacturing chemically pure iron compounds and for standardizing solutions in the analytical chemical laboratory. The electrolytic iron in addition to its purity has its advantage for the purpose just mentioned of rapidly dissolving in an acid solution. A test which was made to determine the rate at which electrolytic iron were sold as chemically pure for standardizing purposes dissolved, showed a ratio of one to twelve, the former being the more soluble. By reason of the brittleness imparted by the occluded hydrogen, it can be readily broken into grains of a desired size and even into a fine powder.

Although the investigations referred to in this paper have covered a considerable length of time, the work which has been done should perhaps be considered only as preliminary to a more extended investigation which it is hoped may be taken up in the future. Summing up the work thus far done shows that it is possible to obtain electrolytic iron in large quantities and at a reasonable cost and that, therefore, iron should be added to the list of metals to which the process of electrolytic refining can be applied satisfactorily. It has been demonstrated also that such iron possesses a high degree of purity, though just how closely it approaches absolute purity can be shown only by spectroscopic analysis or by other methods which are more accurate than those which have been available.

Work on the Sweets Steel Co. plant, Williamsport, Pa., is progressing rapidly and the management expects to have one of the open-hearth furnaces in operation by June 1. The product of this furnace will be shipped to Syracuse, N. Y., where it will be finished. This method will be followed until the Williamsport plant is in shape to do finishing work.

IRON ORE EXPLORATION IN WESTERN ONTARIO.

Interest is now taken in the possible iron ore fields of Western Ontario, where considerable exploration has been carried on for the past year. Those that have explored the Atikokan and other parts of the Algoma country are of the opinion that rich ores exist there, but as yet they have been unable to find anything of value, unless it is possible that the recent finds of the International Iron Co. may be so classed.

In this Canadian portion of the Lake Superior region ore has been found by drilling in the Amimikee series, which is really an easterly extension of the Mesabi ore-bearing rocks, even as far east as Loon Lake, and at other points east of Thunder Bay, Lake Superior. Between Loon Lake and Northeastern Minnesota various explorations have, in the past winter and previously, met more or less encouraging results, though but few of them have actually found ore, and possibly none ore in commercial quantities. The iron formation eastward to Loon Lake, and probably beyond, is similar to that of the Mesabi, though it is thin, and intruded by igneous rocks that have frequently changed and altered the character of the ores. This change is first noticed on the eastern Mesabi, in the central part of T 59 R 14, where there is a decided change in the character of the rocks. If the ore deposit at Loon Lake is of value it will be the first good ore in quantity found between the point referred to on the Mesabi, and the north shore of Lake Superior, a stretch of apparently ore bearing formation more than 150 miles.

The work of the International Iron Co., on Hunters island, and quite near the Minnesota line, has been under way all winter, and with very encouraging indications. A drift has been driven through the jasper and lean ore of a great ridge, and is now in ore of excellent appearance, though as to its quantity there is no knowledge. It is the opinion of the prospectors, certain Duluth, Minn., men, that they have hit upon a discovery of the utmost importance.

In the Atikokan and Mattawan regions, west from Thunder Bay, no large amount of explorations has been under way the past winter, and these districts, generally speaking, are now idle. Two or three diamond drills were operated there last summer, and the finds were not as satisfactory as expected. On the Atikokan range there is a vast outcrop of magnetite rich in iron, very low in phosphorus, and with not as much sulphur as has been generally reported, that should prove of great moment. There are at least 1,000,000 tons shown by some work that has been carried on, above the level of the surrounding country, and holes have shown the formation to extend downward. The owners of this property are now at work on a furnace project. They may decide to calcine their ores at the mine, fuel being at hand, or they may find the intermediate process unnecessary, given a suitable mixture. They hope to erect blast furnaces on Lake Superior, and in Canada in order to take advantage of the bounties there offered for the production of pig iron.

Most of the exploratory work that has been going on recently in Northwestern Ontario has been by American companies, usually steel makers, who are looking to the future for additional supplies, and signifies, to a greater or less extent, the gradual increase of unproductive explorations on the American side, where the area suitable for exploration and at the disposal of the public is growing more and more restricted.

There has been nothing in the nature of exploratory work in progress for nearly a year by the Consolidated Lake Superior Co., whose financial crisis occurred last year. Prior to that time it had been very active throughout Western Ontario, including the region west of Thunder Bay, the east side of Lake Nepigon and the Michipicoten region. In the latter section there is no doubt the company discovered a new ore bearing formation, similar in many respects to the Vermillion range of Minnesota. But its search for mineral in economically important quantities, though skillfully conducted, was not successful, except for what it found in the Helen mine, and for the prospects of a better find at the Josephine. Its diamond drilling at the latter was suspended at the time of its lamentable financial difficulty. It is true, however, that in the Josephine the company has what may prove an important mine. It is stated that one of the first undertakings of this company, upon its reorganization, will be the reopening of its mines and the renewal of its explorations.

PIG IRON WARRANT SALES AT PITTSBURG.

Pig iron warrants were listed on the Pittsburg Stock Exchange last week, the first sale being of 500 tons of Bessemer iron at $13.85 Pittsburg June delivery. The rules adopted to govern the dealing in warrants on the Pittsburg exchange are the same as those published in our last issue with two minor changes. Under Section 2 the deliveries on classes E and F were changed from "Class E shall be delivered by fracture and analysis; Class F shall be deliverable by analysis," to "Classes E and F shall be deliverable by fracture or analysis." The sliding scale for buying and selling warrants was not adopted, but a straight commission for either buying or selling of 6¼ cents a ton. The sliding scale provided for a commission of 6¼ cents a ton where the selling price of iron was below $16 per ton; from $16 and below $21 8¼ cents, and for each rise of $5 per ton above this price the commission was to have increased 2 cents a ton. The following warrant bulletin of the American Pig Iron Storage Warrant Co., governing deliveries against sales made at the Pittsburg Stock Exchange was posted this week:

Each warrant must be:

First—For 100 tons pig iron.

Second—For a good merchantable brand.

Third—For No. 2 foundry, or its equivalent.

Fourth—For Pittsburg delivery or its equivalent.

Equivalent of No. 2 foundry—

No. 1 foundry is deliverable at 50 cents a ton above No. 2.

No. 3 foundry is deliverable at 50 cents a ton below No. 2.

Gray forge is deliverable at $1 a ton below No. 2.

Names and location of yards—

Yard No.	Class.	Location.	Reduction
24	A	Birmingham, Ala.	$4 35
95	F	Sayre, Pa.	?
96	F	Detroit, Mich.	2 10
97	F	Newberry, Mich.	?
98	F	Manistique, Mich.	?
99	F	Ashland, Wis.	?
100	F	Ashland, Wis.	?
102	E	Attala, Ala.	4 35
103	E	Rome, Ga.	4 35
104	A	Anniston, Ala.	4 35
106	Unc.	Bear Springs, Tenn.	3 15
107	C	Graham, Va.	2 55

Total amount in warrant yards May 4, 1904, 66,800 tons.

Plans of the Steel Corporation.

A director of the United States Steel Corporation has been quoted as saying: "Our books show that to date we have spent $41,000,000 on improvement of plants since organization, and our expenses in this line are still going on. Now we are preparing to dismantle six bridge plants at Pittsburg and replace them with a single plant, which will effect a saving of $2,000,000 per annum. Our bridge department produces 500,000 tons per annum, and we have not yet had time to put in the modern electric cranes for the handling of large sections of bridge work, but soon where 30 or 40 men were formerly used to handle a piece of iron a great electric crane will pick it up with the assistance of one or two men and quickly put it in position. We figure a saving here of $4 per ton in operating expenses, or $2,000,000 per annum. If the railroads will not buy our steel goods this year because they cannot sell bonds to pay for them, it is only a question of time when they will buy them in double amounts, and I believe that within three years after the United States shall have returned to its normal steel consumption, the net earnings of the United States Steel Corporation will not only be greater than ever before, but will reach $200,000,000 per annum."

The 12-inch rolling mill at the Pencoyd Iron Works, Philadelphia, was placed in operation this week, and was the last mill of the rolling department to start following the shutdown of last fall. The 12 and 20-inch mills for the present will be run only on one turn. President Major hopes, however, to have the entire plant on double turn within a few weeks.

Creditors of the Model Gas Engine Co., Auburn, Ind., held a meeting May 2 and elected Charles M. Brown, trustee in bankruptcy. Assets of the concern amount to $292,000 with liabilities of $192,000.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades and Iron and Steel Manufacture.

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THE BUSINESS OUTLOOK.

Recent developments in the business world have certainly not been encouraging. Usually at this time of the year sufficient progress has been made in seeding and in the growth of the winter wheat to give a fair idea of what the future has in store. This year all farm work has been delayed. Owing to the extreme severity of the weather last winter and the unprotected condition of winter wheat, we find an especially low average condition at the present time and if we are guided by past experiences we would look for but little improvement to the time of harvest. This view seems to be taken of the situation, judging by the course of the markets at the large trading centers during the past ten days.

But with a year of mixed conditions before us, it is hazardous to make any predictions. It is a time to exercise patience. Railroad earnings continue to show decreases as compared with the previous year, and operating expenses do not make the favorable comparisons predicted. Reports from the West, and Southwest especially, also have been colored by pessimistic advices. On the other hand, some very gratifying reports are being received from certain sections of the West where the value of farming lands is appreciating, and sales of property being made indicate the confidence of the farming interest and the ample amount of money in circulation. At the same time, it is recognized that easy money indicates lessening opportunities for the advantageous employment of capital. This feature is especially noted in the large financial centers such as New York, where there is a marked scarcity of mercantile bills for discount and the plethora of money makes possible the continuance of ridiculously low interest rates in face of the continued large outgo of gold to Europe—$9,000,000 last week and $28,000,000 since April 8. This phase of the situation is the more conspicuous because it is evident that if there were need to prevent this outflow of gold, it could easily be accomplished through the arrangement of credits with foreign bankers. Gold is going to Europe not so much because of its urgent requirement on the Continent, as of the relative ease of the American position. It is a matter of congratulation in this connection that the Panama Canal settlement has been so skillfully handled as scarcely to cause a ripple and that the financing of one-half the Japanese loan in New York will call for relatively small shipments of gold.

The Eastern iron markets, while quiet, recently have preserved a greater degree of strength than has been apparent in the Central West, but even along the Atlantic seaboard there is evidence of a less liberal melting of iron and the accumulation of stocks beyond the current requirements of founders. The fact that furnace agents are receiving requests to defer shipments of iron and coke on contract is taken as confirming reports, especially from New England, that stocks at foundries have increased somewhat recently. That merchant furnaces in Mahoning and Shenango Valleys are likely to turn to a greater extent to foundry iron creates an easier feeling generally throughout the foundry trade, and Southern makers who have felt the loss of recent orders to Northern stacks have accepted lower prices for the balance of the second quarter and are seriously considering making further concessions for delivery during the third quarter of the year.

The heavy melting of steel-making iron, while an encouraging feature, is not accompanied by appreciable business for deliveries extending through the second half of the year. The placing of orders for 60,000 to 70,000 tons of rails by Eastern railroads and the negotiations for a larger tonnage of bridge material in the West, accompanied by buying of machine tools and other car shop equipment, indicates that the railroads are still contributing a fair support to the steel industry. Some car inquiries have developed in the past week, a portion of them for steel cars, but the plate situation in general is far from promising.

In the East, the attitude of labor probably more than any other one element is of the greatest importance and is being watched with more or less concern, being responsible to a large extent for the very moderate tonnage of structural material which is being placed with the mills. Railroads, ship yards, bridge works, boiler shops and carriage and wagon manufacturers have been crippled more or less by dissatisfied labor recently and the spirit of unrest is otherwise menacing.

Under the circumstances it is a matter of congratulation that a wholesome conservatism prevails throughout the business world, and that even with money plenty and cheap there is no disposition among the public to resort to speculative ventures. If like conservatism shall be exercised by the leaders of organized labor, that form of hysteria which seems to reach its height in presidential campaigns may be kept measurably within bounds.

ELECTROLYTIC IRON.

Experiments recently made at the University of Wisconsin by Prof. C. F. Burgess and Prof. Carl Hambuechen in producing electrolytic iron have attracted much attention and somewhat misleading statements have been widely published. The process is not one for the extraction of iron from its ores, but rather for removing the impurities which occur in ordinary

grades of wrought iron and steel. It is, therefore, very similar to the electrolytic process which is used for refining copper. The estimate of cost of refining at less than one cent per pound was made as a result of runs, on a small scale, of several months' duration and the estimate is made on the assumption that the iron be produced on a large scale. It is, of course, recognized that all the factors of industrial working cannot be derived from small scale experimentation, but the professors have been able to get at such factors as the amount of power necessary and the cost of keeping the solution in working condition. The cost for labor can only be approximated. It is also evident that this figure of cost does not take into account the cost of the iron before refining. The methods are fully explained and the probable uses of electrolytic iron are discussed in the paper by Professors Burgess and Hambuechen, published in this issue. While the work thus far done does not point to any important commercial outcome, it will be valuable for the light it throws upon other problems in the metallurgy of iron.

THE NEXT INDUSTRIAL ADVANCE.

The article on the work of the commission appointed by Congress to investigate the American merchant marine, from which we quote elsewhere, brings up a question which while not new is of vast importance to the manufacturers of the United States. We say manufacturers, because the first thought suggested in connection with the enlargement of our shipping interests is that of the vast amount of work that such a program will bring to the ship yards and related workshops. But that amounts to saying that workingmen, farmers —every interest in the land that is helped by any addition to the sum total of work done by the joint efforts of American capital and labor, will be benefited by such a recommendation from the marine commission as will put ship-building and ship-owning and operating in their proper place among American industrial and commercial activities.

If the fact that some one is to benefit from a subsidy program is sufficient to kill off every measure of that character that may be introduced in Congress, then we confess there is no use in discussing the Frye and Hanna proposals. There may have been objectionable features in the bill which failed in the last Congress. It may have provided benefits going too largely to a favored few, to the swift mail carriers that haul a relatively small part of the overseas freight; and that, too, without the prospect of accomplishing the most for the restoration of American merchant vessels to the high seas. But the principle of that bill was not wrong, unless the methods England and other merchant marine powers have followed for years are all wrong; unless the principle on which all the protection legislation of two generations has been built is all wrong.

Subsidies for the rehabilitation of American shipping have been called for in the platform of the dominant political party and have been approved by an emphatic majority of the people at the polls. There has been no misunderstanding the issues. Its intent has been made clear by the advocates of subsidies, in the most public manner. The leading manufacturers' organization of the country, while divided on the tariff and on reciprocity, has strongly favored aid to American shipbuilding and to the owning and operation of home-built vessels under American registry. At its Indianapolis convention in 1902 the National Association of Manufacturers unanimously passed this resolution:

> That this association recommends to Congress such measures as may be necessary to materially extend and maintain American shipping interests sufficient to carry export products of agriculture and manufacture in American ships; and this association recommends a subsidy so distributed as to reach in an equitable manner all American shipping interests and the interests of all American ports.

Here is a broad platform that leaves no room for any of the feeling of diversity of interest between lake and seaboard that has been injected into more recent discussion of the problem.

In this year of slower-paced operation in all industrial lines, after the pell-mell of the past five years, there is time to think of keeping at home some of the millions invested in vessel property, and of the $200,000,000 a year of freights that now go to foreign shipping interests. With every year adding to the magnitude of this country's interests beyond the limits of the North American continent, this problem of larger ship-building and ship-owning becomes immediate and paramount. How it is solved will have much to do with the next expansive movement in iron and steel and in all related industries.

Siloxicon for Furnace Linings.

The Siloxicon Co., of Niagara Falls, N. Y., maker of refractory materials, has developed a substance suitable for protecting the inner walls of metallurgical furnaces. Some particulars furnished by the manufacturers contain the data here given as to the properties of "Siloxicon."

Siloxicon is an oxygen-carbon-silicon compound, which forms in the electric furnace from proper mixtures of silica and carbon, at about 2,500 degrees centigrade. It is exceedingly refractory, neutral towards acid and basic slags, infusible and insoluble in molten metals. At fusion temperatures it is decomposed by free alkalis and in the presence of free oxygen it oxidizes at about 1,500 degrees centigrade. In a neutral or reducing atmosphere, however, it is unaffected until its temperature of decomposition is reached. This temperature is about 3,000 degrees centigrade. Upon decomposition the oxygen is set free, the carbon and silicon uniting to form carbide of silicon, which is in itself an exceedingly refractory material.

Although to a certain extent selfbinding when heated to a high temperature, in commercial work it is advisable to add some form of bond to siloxicon. If it is desired to make up articles of siloxicon which can be baked thoroughly before use, the manufacturers recommend the addition of about 2 percent of finely powdered alumina. Articles made of such a mixture should be baked at a temperature but slightly below that at which silioxicon oxidizes. In certain cases 5 percent of finely powdered, refractory, plastic, non-alkaline clay can be used in addition to the alumina, giving increased strength without detracting from the refractoriness of the article as a whole.

If it is desired to use siloxicon as a lining to some form of furnace, the material being tamped into place and baked in the furnace itself, the manufacturers recommend the use of either silicate of soda or coal tar. In the former case a solution of silicate of soda having a specific gravity of 1.1 should be used. This can be mixed with the siloxicon until the desired consistency is obtained and may be made up into a thin wash and applied as a paint where it is merely desired to protect some other form of lining from chemical action.

S. B. Root and A. Klemm, of St. Louis, have organized the Beardstown Machine Works and will operate a machine shop at Beardstown, Ill.

The Labor Situation.

THE STRIKE ON THE SANTA FE RAILROAD.

E. P. Ripley, president of the Atchison, Topeka & Santa Fe railroad makes an official statement in regard to the strike now in progress: "The company will have no difficulty in filling the places of the men who quit work. We have no quarrel with unionism among our men. We deal with unionism in the case of conductors, engineers, firemen and trainmen, but these unions have never made the outrageous demands to which we were asked to submit by the machinists and which would have transferred to the Machinists' union the management of our shops. Of the men who left our employment probably at least one-half did not want to strike and were not in sympathy with the demands made on us by the union, but felt obliged to go out with the others; for this class I am very sorry and realize the difficult position in which they were placed." The Santa Fe railway officials announce a resumption of work all along the line from Chicago to the Pacific coast. They state that in most cases shops are running with a full complement of men. Vice President Buckalew, of the Machinists' union says the trouble is just begun.

STRIKE IN NEW YORK SHIPYARDS.

All the members of the New York District of the Brotherhood of Boilermakers and Iron Shipbuilders went on strike May 4 from New York and its vicinity as far as Elizabethport. The open shop is the direct issue. The strike involves about 5,000 members of the union and 2,000 helpers, who went out in sympathy. Among the yards and shops affected are: Nixon yards, Elizabethport; the Seabury yards, on Morris Heights; Townsend & Downey, Staten Island; the Burlee Dry Dock Co., Staten Island; the James Reilly repair shops, New York and Jersey City; W. H. Fletcher & Co., Hoboken; Ross Iron Works, Raab Iron Works, Hall & Hurlbert and Townsend & Osberg's yards, Brooklyn, and Reid & Duff's yards, New York. There are also strikes in fifteen machine and boiler shops which are involved. The Lidgerwood Mfg. Co.'s shops in Brooklyn are not affected, as only non-union men are employed there. Secretary Hunter, of the New York Metal Trades' Association, makes the following statement: "The last agreement with the boilermakers was an open shop agreement, though it was made with representatives of the union. This time the delegates of the union wanted us to declare for closed shops and admission of the walking delegates to the shops. This we refused, though we were willing to renew the old agreement. From now on the shops of all the members of the New York Metal Trades' Association will be open shops."

LABOR CONDITIONS IN THE MACHINERY TRADE.

The May number of the *Machinists' Monthly Journal* contains reports from the business agents of the International Association of Machinists, summing up the conditions as they relate to labor in various machine shop centers. Points brought out in these letters are given below:

Baltimore—Conditions very bad. The union had just passed through a strike in which a number of union shops were lost to it, when the fire came sweeping away several union shops and throwing a large number of members out of employment. Manufacturers and business men are accused by the agent of trying to take advantage of workmen on every hand "enforcing methods and conditions which cannot and will not be tolerated, as they believe that any trouble among the working class at this time would, owing to the fire, result in public opinion being turned against organized labor." While 5,000 building tradesmen are reported to be walking the streets and traveling machinists are flocking in, the business agent reports having placed most of the union men remaining in the city after the strikes.

Boston.—The winter was anything but prosperous for machinists, but improvement was noticeable in the latter part of April and indications point to steady employment for members the coming summer. All the local lodges are adding members.

Buffalo.—Influx of machinists from all over the country is complained of. Work is scarce. Strikes at Dobbie and Lehigh Valley shops still on.

Cleveland.—Trade is poor, the majority of shops being reported as running with one-third to two-thirds regular force, with a declining tendency in wages. Probably two-thirds of the shops are included in the manufacturers' organization.

Davenport, Ia.—Reports from lodges on the Rock Island system show that in June, 1903, there were 350 machinists and 310 apprentices, while today's report shows 435 machinists (all but four in the union) and 135 apprentices. Government arsenal is hiring machinists at $2.75 to $4. Members are advised not to take less than $3. Contract shops are not well organized.

Denver.—No strikes in Colorado directly involving machinists, but the coal strike makes business very dull. Some attempts to lower the scale to new men and shops are with difficulty kept going on nine-hour basis so that an attempt to return to 10 hours is not expected.

Lynn, Mass.—Straight nine-hour day prevailed in the winter but on April 1 all shops returned to 54-hour week—10 hours each for the first four days, 9 hours Friday and 5 hours Saturday. At the General Electric Shops (open) with 75 percent of the men on piece-work the premium system was introduced Jan. 1 but is reported discontinued.

Milwaukee.—Trade poor. Employers' bureau of the Manufacturers' Association is hiring machinists and union men are reported not to be dealing with that organization. Some talk of returning to longer hours but no move, as yet; also rumors of premium plan and piece-work methods being under consideration.

Minneapolis.—Railroads began taking on more men in February and few are now idle. Motive power is in bad shape and considerable work is believed to be ahead. Contract shops are slack. Piece-work talked of by several shops on Jan. 1 but not enforced. Lodge held several special meetings to consider the matter.

Montreal.—Grand Trunk railroad laid off 300 men to cut expenses for three months.

Newark, N. J.—Some trouble to maintain the nine-hour day. In one Elizabeth shop, at one time well organized, the men dropped out of the union and a 10 percent reduction in wages is reported. Union tried to prevent the introduction of the premium system by the Long Distance Automobile Co., Jersey City, "but it is the same old story—union men trying to better conditions for men who care not for themselves or their families." In one shop in Newark (union) the men are working eight hours and in another seven hours so as to give as many men as possible a chance to work.

Philadelphia.—One firm talking of starting the premium system—E. H. Godschalk & Co. About 1,000 machinists out of employment.

Rochester.—Strikes at Hohman & Maurer Barometer Works for the nine-hour day and W. P. Davis Machine Co., against the premium system, are still on. Business is fair and few men are out of employment.

San Francisco.—Strike at the Holt Machine Co.'s (agricultural machinery) plant at Stockton, Cal., involved first their blacksmiths; then a committee of blacksmiths, machinists, molders and patternmakers took up the matter. Company had asked its men to sign individual contracts, one provision being an agreement not to strike or to stay away from work during a strike and another agreeing not to belong to an organization whose obligations in any way prevented carrying out the above agreement in good faith. The men refused to sign, "as it would be in direct violation of the cardinal principles upon which trade unionism is founded, taking away from them the right to assist sister trade unions by striking, no matter how just the cause might be." In the effort to settle the union men who had been discharged offered to return to work with the non-union men the firm had introduced, provided the "application for work" were done away with. The company refused. Since then four other blacksmith shops and two machine shops have become involved and the strike has been on for two months.

Schenectady.—General Electric Co. has introduced the premium system in its boring mill department. Machinists in West Albany shops of New York Central have been granted the nine-hour day. At Watervliet the union has prevented the

introduction of the two-machine system at the Government arsenal.

Scranton, Pa.—Agreement signed with Jeanesville Iron Works, renewing 55-hour week. Union lodges in Scranton and Wilkesbarre are working for elimination of piece-work also resisting any effort to reduce wages.

Syracuse, N. Y.—The winter brought slackness in the shops but a reaction has appeared with the opening of spring. The strike at the H. H. Franklin Mfg. Co.'s plant, over the 9-hour day has lasted a year. Non-union men are working there on tne piece-work plan. Work in the district is not as brisk as a year ago. The Oswego railroad shops have returned from the nine-hour day to ten hours.

Toronto.—"We are living fairly peaceably with the manufacturers in Toronto at present, although there is rumbling in the air at the reduction of hours of labor in the metal trades section."

Worcester, Mass.—The correspondent takes a pessimistic view of the outlook for unionism in Worcester. The losing of the strike of 1902 set back unionism greatly. The writer suggests that the intelligence generally attributed to the New England Yankee does not exist in the minds of Worcester machinists.

Youngstown, O.—"An effort is being made to make a 10 percent reduction in the contract shops in Youngstown, but the men are unanimously opposed to it and any cut at all will mean trouble. The firms claim they can't get work at the wages they have to pay and that if the men do not take a cut they will soon be out of employment. But even in the face of that dire calamity, they are determined to keep the wage rate up. Youngstown is the pivot of this district, and any reduction in wages here would mean the same thing in other places."

AMALGAMATED ASSOCIATION CONVENTION.

Very little progress has been made during the past week by the convention of the Amalgamated Association of Iron, Steel and Tin Workers, which is being held in Cleveland. The most important event was the reading of a letter from President Graham, of the American Sheet & Tin Plate Co., stating that on account of the recent reduction of wages of the rollers the collection of the 3 percent wage concession on rebate plates had been suspended temporarily. This was received with great enthusiasm by the delegates, who cheered President Graham. A cause of friction between the company and the men is thus removed and the indications are that no other changes, so far as tin plate mills are concerned, will be recommended by the wage committee. The first three days of this week were occupied by committee meetings.

METAL TRADES ASSOCIATION NOTES.

CINCINNATI, May 10.—Commissioner E. F. DuBrul is spending the week in the East, with headquarters in New York. Secretary Robert Wuest returned May 7 from quite an extensive trip.

The machinists' situation in Chicago is unchanged, and negotiation with the local business agents is under way.

W. N. Taylor, secretary of Memphis Machine Works, Memphis, Tenn., advises that their shops are practically filled and that they are receiving a great number of applications from men desiring work.

B. F. Adams, one of the association's representatives, is endeavoring to secure brass polishers and buffers in Detroit for the Adams & Westlake Co., of Chicago.

The administrative council will meet at the commissioner's office in the Union Trust building, Cincinnati, May 30 and 31. The finance committee for the ensuing year will be named at this meeting.

John Whirl, secretary of the Detroit Employers' Association, is being congratulated because of the success his association is meeting with in handling the labor question in that city.

F. A. Geier, of the Cincinnati Milling Machine Co., the treasurer of the association, arrived home from a four months' tour abroad this morning.

The sentiment is so marked in the N. M. T. A. against any form of agreement that there appears no need of apprehension on that score.

The labor situation at Youngstown, O., has quieted down considerably and it is not believed there will be any trouble.

The number of certificate men of the Association is increasing at a greater rate than the officials of the association looked for. The same condition of affairs exists in connection with the labor bureaus.

Many close students of the Employers' Association problem look for the time when the N. M. T. A. will take in all local metal trades associations, practically making the N. M. T. A. a federation of local associations much along the same line as the organization of the unions. That this is not the case is not remarkable, since the unions have been at work at their organizations for the last 75 years, while the employers have only taken up the question within the last eight years.

F. A. Wilson, secretary of the Boston Labor Bureau, reports that 30 boiler makers of varied age, experience and capabilities have filed applications for employment with him in the past week.

The resolution presented at the Philadelphia convention—"That the present form and organization of the National Metal Trades Association presents the best solution of the problem of the relation of the National Metal Trades Association to local conditions and to local associations and should be maintained in its present form, and the influence of the National Metal Trades Association extended on these lines"—is occupying the attention of the officials of the association, and will be thoroughly discussed at the next meeting of the council. It is, in fact, the most important question up for discussion.

The Chicago Brass Manufacturers' Association holds its annual meeting in the Sherman House at 8 p. m. on Wednesday, May 11.

The Chicago Metal Trades Association will hold its meeting and banquet at the Sherman House on the evening of May 27. This meeting will be a most interesting one, since several Eastern representatives who are students of industrial economy will deliver the addresses of the evening.

Several members of the N. M. T. A. are making arrangements to attend the convention of the National Association of Manufacturers, to be held in Carnegie Hall, Pittsburg, headquarters Hotel Schenley, on May 17, 18 and 19.

In spite of the fact that Egypt Lodge No. 665, International Association of Machinists, at DuQuoin, Ill., have voted to work without contract or conditions, the district business agent, Eugene Sarber, has ordered them to strike. The local lodge, not caring to subject themselves to the annoyances of a strike, thereupon offered to enter into an agreement satisfactory to themselves and the company. This the Blakeslee Mfg. Co. was willing to do, whereupon the district business agent insisted upon the strike becoming effective just the same, disregarding the wishes of the local lodge entirely.

There was a little flurry in the pattern making shops of the H. W. Caldwell & Sons Co., Chicago, which was promptly taken hold of by the association.

LABOR NOTES.

All of the union molders at the Walker foundry, Erie, Pa., have gone on a strike on account of the refusal of the company to discharge a non-union man.

At a meeting of the 650 striking miners at the Chandler and Pioneer mines at Ely, Minn., it was decided to withdraw all objections to Capt. Charles Trezona and return to work. The mines were closed for a week by the strike and the company has not announced when mining will be resumed.

The disagreement between the foundrymen and molders of Utica, N. Y., continues and there is apparently little hope of a settlement. The foundrymen charge the molders with violating the New York agreement of 1899 and the molders make the same charge against the foundrymen. Commissioner Briggs, of the National Founders' Association, offered to refer the New York agreement to any justice of the supreme court of New York and abide by his decision as to the construction of its wording.

The mills of the Canonsburg Sheet & Tin Plate Co., Canonsburg, Pa., have been declared open. One mill is already being operated by a crew of the old men who deserted the union.

Arbitration of the wage scale and working conditions of union machinists was proposed by the Chicago Metal Trades

Association to the Machinists' District Council. The machinists refused to accept the offer.

It is estimated that 8,000 men have become idle, either directly or indirectly, through strikes of employes in the building trades in Philadelphia. The main point at issue is the recognition of the sympathetic strike as a legitimate weapon. The employers say they are determined never to recognize it as such, and the workmen have quit with a view of forcing them to change their minds.

The first break in the strike at the Fore River Ship & Engine Works occurred last week, when upward of 200 of the strikers returned to work at the company's terms. A considerable number of the strikers are still out.

Machinists of the William Tod Co. and the Lloyd Booth Co., both of Youngstown, O., went on a strike last week because some of the men had received a cut of 5 percent in wages. The companies offered arbitration, which was refused by the men, who offered to take a straight 3 percent reduction. This the companies refused, and the plants are closed.

At the annual convention of the Amalgamated Association of Iron, Steel and Tin Workers, in session at Cleveland, the report of the secretary and treasurer showed a balance in the treasury on April 1 amounting to $124,746.68. The disbursements for strike benefits in the year, especially in sheet and tin plate mills, were heavy.

A few days ago sheet metal workers, of Knoxville, Tenn., sent a communication to their employers asking them to grant a nine-hour day and a new schedule of wages. The manufacturers replied that they were willing to sign the contract provided the men would pledge themselves to put in the full nine hours per day and agree to get out all material and "be on their job, whether in the shop or out of the shop, and ready to go to work promptly at working time in the morning and remain on the work until finished or until quitting time in the evening." The men are considering this proposition and in the meantime are not working.

The Allis-Chalmers Co., through Superintendent Niedermeyer, has offered to sign the present wage scale with the sixteen unions whose members are in its employ. Representatives of several of the unions have agreed to the proposition. Others said they would have to refer the offer to their organizations.

A few days ago the Briscoe Mfg. Co., Detroit, received a demand from the officers of the Metal Workers' Union that a nine-hour day be granted. The company replied that it would consider the matter. The members of the union left the shop an hour before time for closing the factory for night and let the company understand that they intended to continue walking out an hour before time daily. When they returned to work the next day, they were told that their services were no longer required.

The Tin Plate Workers' International Protective Association convention, which is in session this week in Columbus, will not make any demands for a wage increase. This conclusion was reached at a meeting of the executive council and wage committee. The convention represents the tin house workers of Ohio, Indiana, Michigan, West Virginia, Pennsylvania and Illinois.

The strike of the structural workers' association at Pittsburg against the American Bridge Co. was declared off this week and all the men have returned to work. The bridge company agreed to discharge its non-union employes at Coral, Pa.

The recently incorporated Autocar Equipment Co., of Chicago, has taken over the business heretofore conducted by the Autocar Equipment Co., not incorporated. It has a capital stock of $6,000 and its business will be the manufacture of automobile and boat motors, carburetors, transmission gears, friction clutches, etc. It will increase its facilities considerably to take care of its growing trade and the prospects are very encouraging for a busy season.

Work has been resumed on the stripping contract at the Higgins mine near Virginia, Minn. It will be necessary to remove 500,000 yards of material to complete the work. This is a Steel Corporation property.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

At the regular monthly meeting of the Pittsburg Foundrymen's Association held at Pittsburg on Tuesday, May 10, Howard M. Hooker read a paper on "Pig Iron Warrants and Their Advantage to the Consumer." The paper was discussed at length, much interest being manifested by the foundrymen present in the warrant system. It is reproduced elsewhere in this issue: President A. W. Slocum told of the hospitality of the Philadelphia Foundrymen's Association and moved a vote of thanks for their invitation, entertainment and the gavel which was presented the association. The thanks of the association were unanimously extended. The following were in attendance:

Ellsworth Kay, Mackintosh, Hemphill & Co.
Paul Kreutzpointner, Pennsylvania Railroad, Altoona, Pa.
S. D. Sleeth, Westinghouse Air Brake Co.
H. E. Field, Mackintosh, Hemphill & Co.
J. Keegan.
Mr. Seth.
Mr. McDougal, Pittsburg Steel Foundry.
A. W. Slocum, National Car Wheel Co.
F. H. Zimmers, Union Foundry & Machine Co.
Mr. Phillips.
E. A. Kebler, Matthew Addy & Co.
W. J. Dorsey, Enterprise Foundry Co.
R. F. Burkie.
Mr. Bassett and Mr. Daft, Rogers, Brown & Co.
J. H. Hillman, J. H. Hillman & Son.
Wm. Yagle, Wm. Yagle & Co.
W. H. McFadden, Mackintosh, Hemphill & Co.
B. D. Fuller, Westinghouse Electric Co.
H. M. Hooker, H. M. Hooker & Co.
G. H. Hull, Jr., American Pig Iron Storage Warrant Co., New York.
C. G. Smith and A. W. Smith, Charles G. Smith Co.
J. Frazier, Mackintosh, Hemphill & Co.
D. P. Thomas, Sterritt, Thomas Co.
Bryan Robertson, Field-Evans Iron Co.
T. E. Malone, J. S. McCormick Co.
Mr. Marshall, L. & R. Wister Co.
T. A. Collison, H. K. Porter Co.
L. E. Dunlap, Mackintosh, Hemphill & Co.
F. K. Smith, Banning, Cooper & Co.
James Fox, H. K. Porter Co.

Iron and Steel Institute Meeting.

Andrew Carnegie presided at the annual meeting of the Iron and Steel Institute held in London, May 5 and 6, and presented the Bessemer gold medal to R. A. Hadfield, the well known engineer and manufacturer of Sheffield. Carnegie gold medals were awarded to Pierre Breuil, of Paris, and Percy Longmuir, of Sheffield. At the dinner of the institute the guests included the duke of Argyll, Earl Gray, Lord Chief Justice Alverstone, Lord Kelvin, Lord Hugh Cecil and Seth Low, formerly mayor of New York. Mr. Carnegie in his address said it was largely because the occupant of the British throne knew other lands so well and made friends everywhere that great and beneficent changes occurring in the mutual relations of these lands were seen. He hoped that nothing would ever disturb the satisfactory relationship of the motherland with the United States. The next meeting of the institute will be held in New York City in October, preceding a trip to various steel-making centers and later to St. Louis, by 500 visiting members of the institute.

Surveyors of the Cincinnati Rolling Road Co. have been in Cleveland recently making surveys of a number of streets, with a view to building moving roadways. In Cincinnati the company has a moving roadway nearly a mile in length. The roadway is intended to be built on streets having a steep grade. The principal material used is steel, of which an endless belt is made. This belt is carried upon a steel structure elevated from 15 to 20 feet above the street and supported by a single line of steel posts.

The Canadian business of the Allis-Chalmers Co., which recently acquired the Bullock Electric Manufacturing Co., of Cincinnati, will hereafter be conducted by a new organization bearing the name Allis-Chalmers-Bullock, Ltd. The works and principal offices of this new company are in Montreal.

The Toledo Stamping Co., Toledo, O., is considering a proposition to remove its plant to Decatur, Ind. The company plans to increase its capacity.

IRON ORE STOCKS AT LAKE ERIE PORTS.

Statistics collected from the various Lake Erie dock managers by the *Marine Review* show that on May 1 the stocks of iron ore at Lake Erie ports were greater than on the same date in any year in the history of the trade, the amount being 4,534,103 gross tons. This is not surprising as furnaces were well supplied when navigation closed and the curtailment of pig iron production by the banking and blowing out resulted in a large decrease in the demand for shipments from docks during the winter. The following table shows the stocks on docks on May 1, 1902, 1903 and 1904, with the amounts on the same docks on Dec. 1, 1901, 1902 and 1903:

Ports	CLOSE OF NAVIGATION			OPENING OF NAVIGATION		
	Dec. 1, 1901	Dec. 1, 1902	Dec. 1, 1903	May 1, 1902	May 1, 1903	May 1, 1904
Toledo	254,196	310,023	106,710	111,511	126,331	160,216
Sandusky	4,384	95,175	95,275	37,400	56,500	68,863
Huron	231,501	232,764	253,249	129,635	147,817	208,008
Lorain	195,863	328,304	288,581	96,992	190,311	237,404
Cleveland	1,378,060	1,500,604	1,337,750	624,865	829,347	968,506
Fairport	710,590	924,236	845,946	472,325	555,709	579,677
Ashtabula	1,769,145	1,967,136	1,911,911	924,742	1,073,967	1,559,028
Conneaut	604,106	673,679	591,364	152,891	125,400	128,018
Erie	470,718	722,966	657,409	223,972	426,744	474,275
Buffalo	198,100	319,367	282,890	73,861	60,241	150,106
Total	5,859,663	7,074,254	6,371,085	2,848,194	3,592,367	4,534,103

The total rail shipments from Lake Erie ports to furnaces in the winter of 1903-1904 appear by comparing dock stocks on Dec. 1, 1903, and May 1, 1904:

	Gross tons.
On dock Lake Erie ports, Dec. 1, 1903	6,371,085
On dock May 1, 1904	4,534,103
By rail to furnaces, winter of 1903-4	1,836,982

Adding these winter shipments to 16,903,013 tons, the amount shipped to furnaces during the navigation season of 1903, gives 18,739,995 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1904, as against 21,905,251 tons in the year ended May 1, 1903; 17,216,065 tons in the year ended May 1, 1902; 14,468,260 tons in the year ended May 1, 1901; 15,882,881 tons in the year ended May 1, 1900; 12,122,982 tons in the year ended May 1, 1899; and 10,209,488 tons in the year ended May 1, 1898. The following table gives stocks and shipments to furnaces during the years named:

ORE ON LAKE ERIE DOCKS, MAY 1, EACH YEAR FOR TEN YEARS.

Year.	Gross tons.	Year.	Gross tons.
1904	4,534,103	1899	2,073,254
1903	3,592,367	1898	3,167,915
1902	2,848,194	1897	3,256,497
1901	3,050,183	1896	1,949,698
1900	1,720,656	1895	2,642,890

ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACE, YEARS ENDING,

May 1, 1904	18,739,995	May 1, 1901	14,468,260
May 1, 1903	21,905,251	May 1, 1900	15,882,881
May 1, 1902	17,216,065	May 1, 1899	12,122,982

IRON ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACES, DURING WINTER PERIOD, DEC. 1 TO MAY 1.

Winter of	Gross tons.	Winter of	Gross tons.
1903-04	1,836,982	1900-01	2,854,487
1902-03	3,481,887	1899-1900	3,809,627
1901-02	3,011,469	1898-99	3,063,153

Estate of Henry W. Oliver.

The appraisement of the estate of the late Henry W. Oliver, of Pittsburg, was completed this week and it shows a valuation of $16,246,327.37. The appraisers' report shows that Mr. Oliver had practically sold all of his extensive holdings in the United States Steel Corporation, owning only $16,500 worth of the preferred at the time of his death. The inventory and appraisement follow: Oliver Iron & Steel Co. stock, $5,448,500; Pittsburg Coal Co. common stock, $1,257,250; Pittsburg Coal Co. preferred stock, $642,500; Calumet & Arizona Mining Co. stock, $1,187,820; Calumet & Pittsburg Mining Co. stock, $213,740; Lake Superior & Pittsburg Development Co. stock, $30,000; Pittsburg & Duluth Development Co. stock, $46,500; Junction Development Co. stock, $4,000; U. S. Steel Corporation preferred stock, $16,500; New York Shipbuilding Co. stock, $137,500; Harvey Iron Co. stock, $275,000; Neeb-Hirsch Pub. Co. common stock, $64,000; Westinghouse Airbrake Co. stock, $6,500; Standard Car Co. stock, $58,300; Safe Deposit & Trust Co. stock, $40,000; Pennsylvania & Lake Erie Dock Co. stock, $12,100; El Cobre mine stock, $15,000; Great Lakes Coal Co. stock, $61,875; New York & Canadian Copper Co. stock (present value unknown), $1; Great Lakes Towing Co. stock, preferred, $9,675; Great Lakes Towing Co. stock, common, $375; Detroit Iron & Steel Co. stock, $42,000; Standard Chain Co. preferred stock $29,295; Standard Chain Co. common stock, $10,944; Standard Chain Co. bonds, $26,100; Allegheny Country Club bonds, $5,000; interest in Chemung Iron ore leases, $4,000,000; interest in United Developmen Co. (present value unknown), $1; interest in Briggs-Oliver Exploration Co. (present value unknown), $1; cash in banks, $641,777.01; due from city of Pittsburg, $303,509.61; mortgage from S. F. Nirdlinger, $600,000; Pittsburg Coal Co. dividend scrip, $30,563.75; notes of Chemung Iron Co., $760,000; note of Pittsburg *Commercial Gazette*, $160,000; notes of various insolvent persons, $95,000; private car, $15,000; total, $16,246,327.37.

Cincinnati Pipe Contract

The pipe contract for the city of Cincinnati, which has been pending for several weeks, has developed some interesting features. The specifications called for bids on 11,000 tons, 7,000 tons of which was 60-inch pipe of a certain tensile strength to be bid upon by itself. Bids were also invited on another set of specifications, calling for 18,000 tons of varied sizes from 48 inches down and about 3,000 tons of specials. When the bids were opened, the United States Cast Iron Pipe & Foundry Co. was found to be the only bidder on cast iron pipe. On the 11,000-ton lot its bid was $26.85 per ton and on the 18,000-ton lot of varied sizes and 3,000 tons of specials, the price was $25.45 per ton. These two bids ran the cost of the pipe $100,000 above the engineer's estimate. The commissioners of waterworks referred the bids to the advisory engineers for a report. It seems that only a few pipe shops in the country could make the pipe called for under the specifications, and as the tensile strength required by the engineer would probably make the use of Northern iron in the mixture a necessity, the United States Cast Iron Pipe & Foundry Co. has an advantage in that the only other large company possible as a competitor is located too far in the East.

Ohio Iron Men's Club.

At a meeting of the Ohio furnace interests in Cleveland on May 4, the Iron Men's Club was organized. The headquarters of the club will be in Columbus, O., and regular meetings will be held on the first Wednesday of each month. The club begins with a membership representing about a dozen furnace companies. The officers elected at the Cleveland meeting were the following: Col. J. G. Battelle, of the Columbus Iron & Steel Co., president; D. B. Meacham, of the Cleveland Furnace Co., vice president; Linn Bentley, of Fieser & Bentley, Columbus, O., secretary and treasurer. There was no action taken at the meeting regarding prices or number of pounds per gross ton.

Robert Angst, chief engineer of the Duluth & Iron Range railroad, who prepares a record of the ore shipping docks of the Great Lakes every spring, giving particulars in blue print form of the improvements to the docks and additions for the year, has just issued his figures for 1904. For the first time since he has been compiling data about the ore docks there were no new docks or additions to old ones to record. The only improvement assured for the future is the reconstruction of No. 3 dock at Two Harbors. The number of pockets will not be increased but the dock will be built higher on the same paln as No. 4, of the same system, which will add somewhat to their capacity.

At the annual meeting of the stockholders of the Tennessee Coal, Iron & Railroad Co., held last week at Tracy City, Tenn., the four retiring directors were re-elected. The directors will meet the latter part of this month and elect officers. It is not expected that there will be any change.

PERSONAL.

H. V. Croll, who has been in charge of the Salt Lake City, Utah, office of the Allis-Chalmers Co. for several years, and who was before that the representative of the E. P. Allis Co. at Spokane, Wash., has been appointed to the charge of the Allis-Chalmers office in San Francisco, as successor to Geo. Ames, who has resigned. Mr. Croll's San Francisco office is 623 Hayward building.

Herbert E. Field, heretofore with the Farrel Foundry & Machine Co. of Ansonia, Conn., assumed the duties of metallurgical engineer for the Fort Pitt foundry of Mackintosh, Hemphill & Co., Pittsburg, on May 1.

M. F. Cunningham has severed his connection, after 15 years' service, with the Waltham Emery Wheel Co., to assume the management of the Superior Corundum Wheel Co. of Waltham, Mass., and is making emery and corundum wheels and stones for all purposes.

Asa M. Mattice, formerly chief engineer of the Westinghouse Machine Co. and now head of the engineering staff of the Allis-Chalmers Co., has sailed on a short trip to England.

Irving A. Taylor, who has for many years been connected with the electrical industry both on the manufacturing side and as consulting engineer associated with A. B. Herrick, has joined the staff of the Engineering Co. of America.

Walter M. Brewer has resigned as treasurer of the Anniston, Ala., plant of the United States Cast Iron Pipe & Foundry Co. He will take a month's vacation before deciding upon where he will locate permanently.

In the report of the Vulcan Detinning Co. for the year ending March 31, President Bloomingdale comments as follows: "The operations of the company during the earlier months of this fiscal year continued to show the successful results of the preceding year, and enabled us to declare dividends of the aggregate amount of $61,250. Subsequently the extraordinary reaction in steel values and the depression existing in the steel business of the United States affected our earnings. The company experienced a severe loss through the destruction of its factory and plant at Streator, Ill., by a cyclone on July 17, 1903. The plant was speedily rebuilt and started operations again on Sept. 21, 1903, the entire cost of the reconstruction having been paid out of earnings and surplus." The company's balance sheet as of March 31 of this year shows plants, land, etc., valued at $3,733,884 and other assets bringing the total to $3,844,440. The preferred stock is $1,500,000; common stock, $2,000,000; accounts and bills payable, $64,533 and surplus and reserve fund $279,907.

Stockholders of the Kenton Gas Engine Co., Kenton, O., have selected the following directors: A. G. Wessling, W. D. Smith, H. W. Gramlich, Jacob Hensel, G. O. Spousler, W. G. Snyder and W. B. Gramlich. The officers are: W. B. Gramlich, president and treasurer; W. G. Snyder, vice president, and George Gramlich Jr., secretary. The new building in course of construction will be rushed to completion.

The fourth monthly meeting of the New York Foundry Foremen's Association was held on Saturday evening, April 30, at Hotel Montgomery, Jersey City, N. J. President C. H. Thomas occupied the chair and Frank C. Everitt acted as secretary. Dr. Richard Moldenke, secretary of the American Foundrymen's Association, gave an address on the educational work of their association as related to the work of the Associated Foundry Foremen. The prepared papers of the evening were then read and were as follows: "Sulphur," by A. M. Loudon; "Carbon," by S. M. Williams; "Precautions Necessary to Produce a Perfect Casting," by H. McPhee. There were 33 foundry foremen, superintendents and others present.

The Jackson Iron & Tin Plate Co., Clarksburg, W. Va., which recently went into bankruptcy, will be sold at public auction May 28. The sale will include the land, building and equipment.

The Hyde Windlass Co., Bath, Me., has issued $5,000 in dividends to its 200 employes. This was the third consecutive annual dividend.

THE WESTERN MACHINERY MARKET.

The Browning Co., Milwaukee, motors and dynamos, reports that its business is remarkably good, April having been one of the best months in its history. At present, its shops are busy turning out the motors for the U. S. Crusier "Galveston," together with other orders for the Government. The company has also received an order for 30 motors for the J. H. McFarland Printing Co., Harrisburg, Pa., and for the entire motor equipment for the plant of the Helvetia Milk Condensing Co., Delta, O., consisting of 30 or 40 motors.

Armstrong Bros. Tool Co., Chicago, manufacturer of tool holders, advises us that the demand for its products is good, among its recent shipments being a very large order for tools to the Moline shops of the Rock Island railroad.

Union Steam Pump Co., Battle Creek, Mich., says that business throughout the country has a sluggish tendency and that it must be worked harder to be landed. Its own business is in about the same condition as it was a year ago.

Henry Vogt Machine Co., Louisville, Ky., manufacturer of ice and refrigerating machinery, etc., writes that while it has secured its share of the business offered this spring, it has been disappointed at the large number of prospects that have fallen through for want of financial support. The inquiries were very numerous throughout the past winter and spring, but a large proportion of them either did not materialize or were postponed for another season. The company shipped during April a 200-ton machine to the Atlantic City Cooling Co., Atlantic City, N. J.; a 150-ton machine to the Baltimore Refrigerating & Heating Co., Baltimore, Md., also machines to Pittsburg, Kansas; Indianapolis, Ind.; Mt. Vernon, Ill.; Stanford, Ky.; Central City, Ky.; Berkley, Va.; Logan, O.; Radford, Va.; Springfield, Ky.; Camilla, Ga.; Oxford, Miss., and consignments to India and Japan. At present, two 120-ton machines are being completed for the Merchants' Refrigerating Co., Louisville.

Vilter Manufacturing Co., builder of refrigerating machinery, Corliss engines, etc., advises us that it is gratified at the amount of work it has been receiving; and that from its observation, it expects to have a continuance of this condition for some time to come. Its shops are working day and night, among its shipments in the past month being some of very large capacity.

Brown Corliss Engine Co., Corliss, Wis., writes us that while in the past two or three months there has been little engine work placed with any of the larger engine manufacturers, it is of the opinion that from the number of jobs being figured upon at the present time, the turning point has come. The company nas recently closed an order for two large tandem compound engines to go to one of the New England States and is figuring on a great many new plants. It expects shortly to enter the gas engine and turbine business as well as to make machinery for flour mills.

Charter Gas Engine Co., Sterling, Ill., manufacturer of gas and gasoline engines, says the volume of its sales is very favorable. In the past month it has shipped two carloads of engines to different points in Texas, one to Wyoming, another to Los Angeles, and has orders on hand for carloads to go to Louisiana and Florida. It advises us that carload business at this time of the year is somewhat unusual, and therefore it is more than gratified at the amount of business it has been receiving.

Marinette Gas Engine Co., Chicago Heights, Ill., reports that the indications for a good volume of business the balance of the year are very promising and much beyond its expectations. The company is far behind its orders despite the fact that it has moved into a larger and more modern plant, and it expects to be taxed to the fullest capacity for several months to come. To better meet this growing demand, the company is getting out estimates for additional tools and for an electric traveling crane for its foundry. Among the orders received in the past month, was one by cable from Portugal for five double-cylinder engines, direct-connected to generators, for lighting purposes. A 75-h. p. 3-cylinder engine, direct-connected to generator, was recently shipped to Lisbon, for installation in the building occupied by the Bank of Portugal, where the company has several other engines installed.

PIG IRON WARRANTS SYSTEM AND THE FOUNDRYMAN.*

BY HOWARD M. HOOKER.

In the brief paper prepared for you on the "Warrant System and Its Advantages to the Foundryman," it may not be amiss to give you a brief history of its origin. The pig iron storage system had its origin in Scotland something over 60 years ago, and, as is usual with the beginning of important enterprises, it was born of necessity, history telling us that some furnaceman found it necessary to find a temporary warehouse for some of his pig iron after it had left the point of manufacture. This iron was stored with the Messrs. Connal, lumber dealers, and so frequent was the call on them for storage room from other furnaces that in time they dropped out of the lumber business entirely and devoted their time to the yarding of pig iron. The firm of Connal & Co., Ltd., exists today and yards practically all of the warrant iron in Great Britain. From having a central storage yard at Glasgow, the birthplace of the warrant industry, they have now a yard installed at each furnace, thus eliminating the cost of one handling and some freight.

The history of the industry in this country does not cover so much of a period of time, but with the exception of a few months in 1903, when excessive prices for pig iron ruled, the American Pig Iron Storage Warrant Co. has had iron in its yards since 1889, the year it was organized. Reference is made to 1903, too, for the reason that it is from the conditions under which the consumer suffered during that year that much of the present interest in the introduction of the warrant system is due.

As a simple proposition, the warrant system comprehends the storage of excess pig iron during the times of depression and consequent lack of demand, and puts in such shape that it may be carried for any length of time until the demand exists. In the meantime the iron in warrant is not idle, as we shall presently show. In explanation of the term "warrant": This is a negotiable form of warehouse receipt, setting forth that there has been deposited in one of the company's several yards a certain one hundred tons of pig iron of a certain grade and brand; that upon the surrender of such warrant in the proper manner, they guarantee to deliver that particular lot of 100 tons of iron free on board cars at their warrant yard. The grade and the weight of the iron is guaranteed by the warrant company, based on its inspection when the warrant was issued.

While it has been shown that these warrants have been issued for a matter of fifteen years, it may seem curious to you that they have never been offered generally to the consumer, although offering the buyer of iron the greatest attractions. Inquiry on this point develops that pig iron in the form of warrants has always been of interest to pipe works and large melters, as it offered them a means of buying a large tonnage at a price somewhat lower than that ruling on actual pig iron; that the delivery of it or its equivalent could be made entirely at their option and not at that of the furnace, thus acting as a safety valve on their iron supply; and, further, that they could in this way cover a contract that involved delivery of finished material covering several years, with perfect ease.

It is in the protective feature that you will find your greatest interest. Many of you have doubtless had the opportunity of figuring on contracts involving pig iron beyond a point that no blast furnace will name a reasonable figure. Usually, beyond a period of six months ahead no blast furnace cares to figure, unless the market is in an inflated condition. The uncertainties as to the future cost of ore, or of coke, or the probable advances in labor, are likely to be offered in justifying this refusal. But let us assume that you have the same inquiry with the warrant system in general use and warrants on sale where the price is readily determined. You can easily ascertain what warrants will cost for delivery either six months or five years hence, by simply adding to the present price the small carrying charge.

Let us say that you secure the contract mentioned. Your line of procedure is to first purchase warrants, either prompt or future, representing the tonnage involved, or, if you consider it wisdom, only a proportion of same. When the time arrives for your use of the pig iron, you sell your warrants to the extent of the tonnage required. If the market for pig iron has advanced, the price of warrants has also advanced and your profit on the sale of warrants takes care of the advance you are compelled to pay for pig iron. If the warrant market has declined, the difference is absorbed by the lower prices you pay for pig iron. The result in either case, as you will see at once, is to make your pig iron stand you at what it was originally estimated at the time your contract was made. Could anything be more admirable, and could anything be more simple? Bear in mind what your experience has been with sliding-scale contracts, which seemed to slide the other way, and more frequently demanded the services of an arbitrator.

In placing these warrants before the consumer, no attempt has been made to make fine-haired distinctions between brands produced in the same general locality and of practically the same materials. If such a plan were pursued, it might lead to endless complications. The standard classification thus far adopted is as follows:

Class A—Southern coke.
Class B—Northern coke.
Class C—Virginia coke.
Class D—Standard Bessemer.
Class E—Southern charcoal.
Class F—Northern charcoal.

With the increasing growth of warrant yards, there must, of necessity, be other classes added to offset either the point of quality, or to put like irons with like freights on a Pittsburg basis. Classes A, B and C are subdivided into four grades by analysis and fracture, the grades by fracture being the well known 1, 2, 3, and gray forge. The grades of analysis are as follows:

Grade.	Silicon.	Sulphur.
No. 1	2.75	0.035
No. 2	2.25	0.045
No. 3	1.75	0.055
No. 4	1.25	0.065

these being the standard specifications for foundry pig iron as adopted by the American Foundrymen's Association. The variations allowable under these specifications are those of 10 percent of silicon either way and .01 in sulphur above the standard.

Class D, standard Bessemer, comprehends warrants of the well known limits: Silicon, 1.00 to 2.00 percent; phosphorus, .10 and under; sulphur, .05 and under.

Class E, Southern charcoal iron, comprehends warrants covering six grades, from No. 1 to No. 6. Warrants are also issued by analysis in this class.

Class F, Northern charcoal, comprehends warrants based on the accepted standard of Lake Superior charcoal analysis and numbers from No. 1 to No. 7.

For the purpose of putting these warrants before you and the consumer generally in a way that will enable you to know at all times their actual market value and consummate their sale or purchase on a moment's notice, the American Pig Iron Storage Warrant Co. has listed them in the classification just mentioned on the Pittsburg Stock Exchange. Dealers in pig iron all over the country are much interested in the movement and the fact of their co-operation will indicate to you that the plan has most substantial support.

A word or two will not be amiss on the subject of exchange dealings. For the sake of maintaining uniformity, all transactions will be made as of Pittsburg. In the case of coke irons in classes A, B and C, all sales will be made on the basis of No. 2, with a rise of 50 cents per ton for No. 1 and a fall of 50 cents for No. 3 and a fall of 50 cents more for gray forge, or No. 4. No one warrant in these classes will call for iron both of fracture and analysis; it will be one or the other.

In closing, permit me to say that the pig iron warrant system does not pretend to supplant the usual method of buying and selling pig iron. It does present a means for your protecting yourselves in a way that no blast furnace can for you.

*Read before the Pittsburg Foundrymen's Association, Tuesday, May 10, 1904.

The Majestic Bed Mfg. Co., Springfield, O., has purchased the plant of the Architectural Iron Co., of that city, the price being $16,000.

LAKE SUPERIOR IRON MINES.

Arrangements are being made to reopen the Miller mine, of the Pitt Iron Mining Co., in section 4-58-15, Mesabi range. Machinery has been put in the past winter and buildings erected for a considerable product. The mine will be arranged underground for a through tramming system that is expected to make tramming to shaft quite reasonable. This mine pays a royalty of 35 cents a ton, with an annual minimum of 100,000 tons. It is operated for the LaBelle Iron Works.

A good deal of exploration is going on in the vicinity of the Miller mine, in the north part of town 58-15. Five drills are working on an 80-acre tract of the Longyear Mesabi Land & Improvement Co., under the direction of E. J. Longyear, and a row of holes across a 40 has been put through ore of good quality. Holes to the north have cut into granite and to the south have been in slate. There are several million tons proved. Mr. Longyear expects to continue this exploration for some time. A very interesting and important fact has evolved by means of this work, in the discovery of granite to the north of the ore body, for this mine is two miles due south of the Stephens, where the Oliver Mining Co. has an enormous property. It has been the accepted theory that granite on the Mesabi was the older and north rock. But it now appears that a tonnage of granite cuts off from the projection running to the ore bearing formation in section 33, this town, and divides the ore formation into two parts, in one of which are the mines in the north part of 58-15, and in the other the main strike of the range, through the Stephens, off to the northeast. This accounts for the discoveries of ore in sections 3, 4 and 5, 58-15, which in the earlier days seemed too far south for successful exploration, and may lead to more ore still further east along the same strike. It is a fact that options for exploration have been given within the past few days on lands in section 2, 58-15, and in 35 and 36 of the township north, and that work in these explorations commences shortly. This clearing up of a puzzling question by the discovery of this granite opens a series of similar questions at one or two other points on the Mesabi. This granite is of a feldspathic character, and rock that was found in other holes in section 4, and then called an altered taconite is now seen to have been the same as is now found north of the ore in section 3.

Scranton mine of Pickands, Mather & Co. and the Lackawanna Steel Co. has been closed indefinitely, on account of the excess of water in the workings. It will be reopened when conditions are more favorable.

The Oliver Mining Co. has laid off one shift at its Aragon mine at Norway, Menominee range, suspending work at No. 4 shaft. No. 2 continues in operation with 250 men, but it is reported that it, also, may be closed. Too much ore in stock, coupled with lack of stock-pile room, is given as the reason.

Stripping operations at Forest mine, of the Tesora Mining Co. are now under way. This is a small job, for the ore body is in many places only 6 to 8 feet below surface, and the total area is not large. The mine has been opened underground to a small extent, and exploration has been under way since last year. It mines a nice grade of Bessemer hematite.

The Mahoning Ore & Steel Co. will carry on stripping during the summer more or less actively, and will mine a little less than the usual annual product of 1,000,000 tons.

The Sligo furnace, St. Louis, is to use Mesabi ore again the coming season, and has made purchases, largely of Stevenson, which will go south all rail, via the Great Northern and connecting lines.

Tracks of the Great Northern road are being built into the Susquehanna mine, at Hibbing, coming from the main line a mile or so southward. This mine will ship its entire product over that road. The mine is being rapidly developed and extended underground and is now prepared for a large product this season.

Pumps at the Volunteer mine, Cascade range, are still running as they have been all winter, but this is the only sign of probable early activity. There is a large stock of ore on hand, and many idle men are about the location. Few families have moved from Palmer this spring, however, the hope being that a resumption will soon come.

The surrender of striking miners at the Chandler and Pioneer mines at Ely, Vermillion range, was absolutely unconditional, and was induced, in addition to the weakness of their position, by the demands of the merchants of the town. The mines will not open till after navigation has resumed. In addition to letting the mines remain idle the Oliver Iron Mining Co. has closed its other mines on the range, and now none are operating. The reason given for closing the remaining three was that stock-pile room had been exhausted.

It is expected that operations may resume at the Richmond mine soon after the opening of navigation. At the old Mesabi Friend, which has a very considerable development, nothing is liable to be done this season, unless conditions change materially.

Finds made a few months ago by G. A. St. Clair, in lot 6, section 6-58-15, Mesabi range, have been steadily developed until there are now about 5,000,000 tons shown up. This is good ore, a trifle high in phosphorus. Mr. St. Clair is still exploring. On lands adjoining, in lot 7, C. H. Bradley and others have a hole down 350 feet in surface and taconite but have found no ore.

The new steel house for B shaft at the Pioneer mine at Ely, Minn., will be ready for assembling and riveting in a few days. It will be the largest shaft house in the United States, having a height of 165 feet and a base 30 x 114 feet, the whole resting on a solid concrete foundation. In bringing ore up from the mine the skips will rise to a height of 103 feet before dumping the ore into the pockets in the shaft house.

The East Norrie mine on the Gogebic range, has suspended operations, throwing 500 men out of employment. The mine has no more room for stock piles and it is not known when it will resume operations, but will probably do so soon after navigation opens.

G. W. Young, manager of the Hiawatha mine, at Stambaugh, Iron county, Minn., is making an arrangement to begin active explorations on section 12, next to the Baltic mine. This property has been explored during the past year with very favorable results. A shaft will be sunk and crosscuts run to determine the extent of the ore body.

The Cleveland-Cliffs Iron Co. is just completing, for the operation of its Lake mine at Ishpeming, Mich., a power plant which is one of the best in the Lake Superior regions. The plant consists of a boiler and engine house, having brick walls with steel roof trusses, the boiler rooms having steel columns also. The boiler plant consists of five 72-inch by 18 feet horizontal tubular boilers for 150 pounds of steam pressure, equipped with Murphy automatic stokers, and the coal bins are placed overhead, carried from the roof trusses, so that the coal runs from the bins direct to the stokers. There is an ash tunnel underneath the ash pits, traversed by a tram car. The ashes are dumped directly into the car by the simple movement of a lever, and are run down to a pit, where they are automatically dumped. There is also a Green economizer in the uptake of the boiler. The smokestack is of radial brick, 6 feet 6 inches internal diameter and 166 feet 6 inches high from the foundation, and built by the Alphins Custodis Chimney Construction Co. This stack is second in size in the Lake country, the largest being the stack at the Calumet & Hecla Mining Co. plant at Calumet, which is 251 feet 6 inches high and 12 feet 6 inches internal diameter. The engine room contains a hoist, compressor, tram engine and dynamos, and is commanded by an 8-ton hand crane. The hoist consists of a pair of 20-inch by 32-inch Corliss engines driving two 7-foot diameter by 4-foot face drums. The drums have steam operated clutches and brakes and the engine has steam operated spiral reversing gear. This machine was built by the Sullivan Machinery Co., of Chicago. The compressor has a capacity of 4,000 cubic feet of free air per minute and has 22 and 45 cross compound Corliss steam cylinders, exhausting into an attached condenser of the Nordberg type. The air cylinders are 37 and 23 inches in diameter, all with 48-inch stroke, having Corliss inlet and outlet valves. The inter-cooler is of the spray type. The electric tram plant consists of a 75-kilowatt 4-pole General Electric generator, and has 13 and 22 by 14-inch Ideal tandem compound engine with independent condensers. The cooling water for condensing purposes and jackets on the compressor will be supplied from a cooling tower. The building is not quite completed, but the machinery has been installed and will soon be placed in operation.

Centrifugal Fans and Their Use in Shop Heating.*

BY R. B. HAYWARD.

The centrifugal fan in use at the present time is in itself a simple mechanism. The engineer meets it, however, in nearly all lines of his work; so that a study of its operation and application is, it is hoped, always of interest. The common form of the machine is the housed fan, the blast wheel enclosed in a casing of cast iron or steel plate. This form allows the control of the volume and pressure as conditions demand. A second form usually called a cone wheel consists simply of the blast wheel mounted on a shaft supported by suitable bearings; and in its application it is placed with its inlet before an opening through which air is to be drawn. Its operation induces the air to flow into the blast wheel, as it were, and leave it at all points on the periphery of the wheel in a direction at right angles to the entrance of the air into the wheel. This form of fan is simply a modification of the housed fan and it is obvious that the air movement is not so easily controlled when originated with this type of fan. Should it be desired to control the air after leaving the wheel it would be necessary to operate the machine in a large air-tight room from which the air leaves through special passages. This application has space requirements that are hard to meet; yet this type of fan has some advantages over the housed fan, as it is obvious that the cone wheel of equal area will handle more volume because of its discharge area at the periphery being unrestricted, consequently permitting a flow of air past all points on its periphery; whereas the housed fan discharges only through the housing outlet. On the other hand, the condition of the cone fan is approached in the housed fan by constructing the housing on a properly formed spiral giving a reservoir space for the air to accumulate in between the periphery of the wheel and the housing.

The third form of fan is the familiar disk or propeller type similar to the small desk fan. This fan draws air into itself and discharges it without changing the direction of flow and owing to the character of the application of power to the work of air movement, the effect of the application does not approach the positive result obtained with the form of blast wheel present in the cone fan or the housed fan. The use of the propeller fan is, therefore, confined to air movemerts where the resistance of flow is negligible.

The foregoing indicates necessarily the reason for the use of the housed fan in practically all of the cases where low pressure air movements are required. In the air blast for the small forge, the handling of light materials, the conveyance of air for ventilating or for carrying heat units for heating purposes, the furnishing of air for fuel combustion under boilers or heating furnaces, all these require that the movement be confined or controlled in a system of distribution, of which the fan housing is a part, the blast wheel or fan proper being the impelling member that originates the movement.

The Centrifugal Fan in Heating Systems.

It is well known that the centrifugal fan has found its greatest use in the field of heating and ventilating of large buildings; from the seemingly crude mill building, where it is simply a question of heating, to the schools and other public buildings where the health and best efforts of occupants require the best methods of heating and ventilation that the engineering profession can devise. There are many good reasons for using the fan or hot blast system for heating large buildings instead of the old method of heating by stoves and direct radiation, and it is not out of place, perhaps, to mention a few of the advantages of the one over the other.

In buildings of large cubical contents spread over considerable area, the use of stoves is out of the question. In a modern factory or mill the floor space that would needs be sacrificed to make a fair showing toward heating with stvoes or salamanders would prohibit this method of heating. The endless labor to keep a large number of stoves scattered over considerable area supplied with fuel, the escape of noxious gases—these and other objections have made it necessary to adopt different methods.

Direct radiation is a method of heating for factory and mill work not uncommon, though it is seldom used now in a modern plant of any size where a thoroughly adequate system of heating is required. The first cost of a direct radiation system is about the same as a hot blast system for small and medium size buildings. The operation is simple, there being no moving parts to care for and a few valves will control its operation. In small buildings of 75,000 to 100,000 cubic contents, direct radiation using live or exhaust steam is quite practicable; but in large modern industrial buildings other considerations make the heating problem assume an entirely different aspect. Direct radiation means the distributing of steam coils or other forms of radiating surface throughout the building. This presents disadvantages that may readily be appreciated. To be most effective this surface should be placed as near the floor line as possible, to counteract the influx of cold air through the opening of doors and natural leakages; yet it is scarcely ever possible to locate the surface in this way, as the necessary free wall surface at the desired points is not available. Further, it is often undesirable to use such wall surface, even though it is most practicable from an engineering standpoint. It is not agreeable for a machine operator to stand continuously within a foot or two of heating surface designed to heat a space much greater in proportion than the area he occupies.

In some industries the materials used would be damaged by coming in contact with the surface itself or from the water escaping through leaks that are always present. Therefore, more or less valuable floor space is sacrificed. The proper drainage of this system is frequently very difficult to accomplish. Water hammers occur, producing leaks involving additional cost for maintenance. Where surface cannot be located near the floor line it becomes necessary to place it overhead suspended from the roof trusses. This is not always possible, and even so it is removed from its zone of usefulness, for there is no force to distribute effectively the heat extracted from the steam, to the points where it may properly perform its function. This is true of direct radiation, as a rule, and it is therefore likely to be more or less local in its effect.

It may seem that the above is a departure from the general subject under discussion but it is intended to assist toward a clearer understanding of the application of centrifugal fans to the heating and ventilating of industrial buildings.

Elements in a Hot Blast System.

Generally speaking, there are four parts or features to a hot blast system of heating as usually installed in an industrial building: The fan, the heating coils, the distributing system and the driving mechanism. Aside from this there are the matters of steam connections, foundations, location of apparatus in relation to the space to be heated, and operation of the system, to be taken into consideration. The fan, as previously stated, is of the housed type and being of steel plate construction appears in many forms. It may be of the full housing type; that is, with the housing constructed entirely of steel plate, or of the three-quarter housing type, with the foundations forming a part of the housing, the blast wheel dipping below the floor line into a pit which is made to form a continuation of the standard scroll of the housing. The fan outlet may be tangential to the periphery of the blast wheel in a horizontal, vertical or an angular direction.

The heating surface is divided into sectional coils of various dimensions and containing different amounts of surface. Each section consists of a cast iron base, with steam and drip compartments, the pipe, usually of the one-inch size, being screwed into the base in such a manner that a series of loops is formed between the steam and drip compartments of the base. The pipes spaced lengthwise 2½-inch on centers afford a passage for air approximately 40 percent of the gross area of the face of the section. The sections are made two and four rows wide, each row being staggered with respect to the row in front and behind it, compelling the air currents passing through to be broken up and impinge upon the surface. With the common form of base a steam receiver for a series of sections is made by extending the casting beyond the pipes on one end of

*Read before Structural Section, Engineers' Society of Western Pennsylvania, May 2.

the base, and forms a section of a cylinder provided with flanges. The group being assembled, bolts passing through the flanges form a complete receiver provided with a single steam inlet and drip outlet. Other forms of bases have individual steam inlets and drip outlets that are used where refined regulation is desired, the temperature of the air being varied by cutting the sections out or in, the volume remaining constant.

The distributing pipes or conduits for the heated air are usually of galvanized sheet steel construction when placed overhead or of brick and concrete ducts and terra pipe when placed underground. Leaving the apparatus the ducts are of proper size to carry the total volume of air, at a proper velocity, and reduce in area as the proportionate volumes of air are distributed.

There are several ways of driving the fan or impelling member of the distributing system; the particular method depending upon the local conditions. A steam engine either direct or belt connected, the electric motor direct connected or belted, are the usual arrangements employed, and sometimes it becomes expedient to drive the fan from a line shaft.

Factors that Determine Equipment.

The general features of the equipment for a fan system of heating have been outlined, but the most interesting to the engineer perhaps is a consideration of the conditions that affect the calculations employed in the design of an equipment for a particular case and why some buildings require different treatment than others.

If a given building could be made absolutely proof against all heat transmission losses the heating problem would be insignificant. Under such conditions it would be necessary only at the beginning of the cold weather period of the year, to inject a few heat units into the buildings and the heating question would be at an end. Unfortunately, however, for the capitalist and fortunately for those that live and have their being in the heating business such is not the case. There is a continuous transmission of heat units through the walls of a building, the exterior temperature being below the necessary interior working temperature, directly proportional to the difference between these two temperatures. This is the most important factor affecting the heat loss; but the material of the walls, whether of wood, brick, stone, glass or any of the many materials of construction, together with the character of the exposure, etc., are variables which play their part in reducing the temperature of a building. It is the function of the heating equipment, whatever its character, to overcome these continual losses by supplying heat units to offset those lost.

Scientific treatises provide us with data in the form of coefficients, representing the heat transmission in units per hour per square foot of surface per degree difference in temperature, for walls and surfaces of given construction and of varying thicknesses. This is available for use with proper allowances for local conditions with heating systems that do not involve a constant changing of the air inside of the building. With the fan system, however, the air is constantly being replaced, unless the re-circulation method is used, so that another heat loss occurs through the escape of a certain quantity of air at the interior working temperature. The foregoing therefore gives the items that appear on one side of the calculation sheet of the heating problem. Turning to the source of heat supply the determination of the proper capacity of fan and heater is the item required to balance the preceding calculations of heat losses.

Proper capacity in the fan and heater means that the heater will so warm the volume of air which the fan discharges that the total number of heat units extracted from the steam through the medium of the heating surface and imparted to the air discharged by the fan into the space to be heated, will offset those heat units lost by wall transmission and other causes. Obviously certain limitations and proportions have arisen as the result of direct experiments and experience. Considering the clear or free area between the pipes of a heater section, it has been found that the efficiency of the heating surface is affected by the velocity of air through the sections. The limits of velocities are between 1,000 and 1,800 feet per minute. Beyond this limit any added advantage is more than offset by the increased friction of the air and cost of additional surface and below this limit the condition of the direct radiator is approached. By efficiency of heating surface is meant the greatest number of heat units that a given surface will give off per unit of time.

The effect of air in motion on condensation of steam in pipes is well known; and therein lies one of the principal advantages of the fan system. Experiments have shown that a given amount of surface properly designed for its duty in connection with a fan system will condense from three to five times as much steam percent of time as the same amount of surface exposed to the usually still air of a building and used as a direct radiator. In other words, it requires only one-third to one-fifth as much surface with a fan system as with a system of direct radiation; and further, the surface is all assembled in a very small space so arranged that proper drainage is easily attained.

The free area through the heater section or through several sections assembled remains constant through the depth of the heater. The air passing naturally increases in temperature but not in direct proportion to the depth. In other words the sections that receive the air last are not as efficient as the first sections, because there is less temperature difference between the steam inside the pipes and the air outside than with the first section; the steam pressure upon the entire surface is the same, consequently the same temperature all over the inetrior of the radiating surface. This falling off in efficiency obviously defines a limit to the depth of the heater or number of rows of pipe that the air should pass over. The standard depth of heater for the kind of buildings under discussion is twenty rows, although there may be some variation either way.

The standard heater, therefore, consists of 1-inch pipe spaced so as to give 40 percent of the face of a section as clear area and in depth approximately twenty rows. Careful observations and tests have shown that surface arranged in this manner subject to air velocities within the limits previously mentioned has a condensing capacity per square foot of 2 to 2½ lb. of high pressure steam per square foot per hour with the initial temperature of air reasonably low. This is affected by other variables such as actual velocity through heater, initial temperature of air and the specific steam pressure. Knowing the radiating capacity of heating surface per unit of measurement, from the previous calculations of heat losses the amount of surface may be determined. With the properly calculated surface the size of fan required is that machine with sufficient capacity to produce the proper velocity through the selected heater.

Selection of Fan.

The selection of the proper fan presents another very important problem. A machine running at a high rate of peripheral travel will deliver the required volume, but a larger machine running at a correspondingly less rate of peripheral travel will also perform the same duty. Consulting the capacity tables for various machines at varied rates of peripheral travel, the desired volume is found in a machine operating at 1½ oz. pressure, a peripheral travel of approximately 6,300 feet per minute. The same capacity is also found in a larger machine at 1 oz. or 5,100 feet travel per minute and still a larger machine operating at ½ oz. or 3,650 feet travel per minute. The second and third machines are operating against ⅔ and ⅓ of the pressure, respectively, that the first machine operates against, yet all are delivering the same volume. Consequently the second and third machines consume ⅔ and ⅓ of the power, respectively, that the first machine requires for its operation. Apparently the third machine is the one to be selected. The requirements of heating, however, are by no means constant and although heating plants are designed for zero weather conditions, there are a very few days throughout the year that the maximum capacity is required. A fan selected to operate at 1 oz. speed for maximum requirements would actually operate at between ½ and ¾ oz. pressure for practically all of the time, in this section, although the reserve capacity is present when required. In view of this it is practice for factory heating to select fans operating at 1 oz. pressure for maximum conditions as the increased cost and interest for a fan to perform the maximum duty at ½ oz. would more than offset the cost of additional power to operate the smaller fan, during a few zero days throughout the season.

The space limitations would further affect the determination of fan size.

Method of Calculating Capacity.

The method of determining proper capacity of apparatus by means of transmission losses and radiating capacity of heating surface is the ultra scientific method, undoubtedly, although it is subject to many variations that cannot be accurately determined. It will be readily admitted that even to measure all of the wall and roof surface of an ordinary mill building, to determine its amount, character and proper co-efficient under existing conditions, besides other factors of equal importance, would be rather impracticable and frequently decidedly inconvenient. In view of this the engineer engaged in this line of work can consistently swallow his professional pride and adopt methods which, while not so scientific perhaps, are equally accurate.

The common method for calculating for factory buildings and practically all kinds of buildings in fact is based on air changes per hour. The practical arrangement of heating surface has been outlined and the resulting temperature of air at various velocities and steam pressures observed. With a velocity through the heater of approximately 1,800 feet per minute steam at 5 lb. initial air temperature at zero, the resultant temperature will approximate 125 degrees. This will be increased to 150 with high pressure steam, or the resultant temperature from 5 lb. pressure will increase should the velocity be lowered and in either case the resultant temperature is affected by the temperature of incoming air. Every size of fan calls for a given size of heater at the fan's predetermined speed for maximum conditions. With this data well in hand, it is quite expedient to standardize experience into methods of calculating on the basis of air changes per hour. It is here that as in all other lines of engineering, sound judgment based upon experience becomes an important element.

The rate of air change for factory buildings ranges from once in 12 minutes to once in 40 or even 60 minutes. The small, poorly constructed building, with contents of 100,000 cubic feet or less, exposed to high winds and subjected to a constant opening of doors and other leakages, calls for the extreme. On the other hand the mammoth structures seen today, with acres of floor space under one roof, require but the other extreme in the way of heat supply to maintain the proper working temperature. These large buildings sometimes run as high as 20,000,000 cubic feet in content, in which case the ratio of exposed surface to cubic contents is vastly different from that of the small building. Then, too, the best construction is used; brick walls, slate roof and although the glass area is considerable for the purpose of light, windows fit well and chances for leakage are reduced to a minimum. Between the two cases just mentioned come the moderately sized fairly constructed building that requires different treatment which is usually a 20 to 25 minute change.

The location of the apparatus with respect to the space heated is considered with the view of a position as centrally located as possible. This affects the cost of the distributing system materially. With heat distributed from the center of a rectangular building for instance in preference to the end a saving of 25 percent is made in the cost of the distributing system; and as the cost of distributing is sometimes one-half of the entire cost or even more the saving is considerable. Other considerations have their influence, however, such as proximity to source of steam supply, a desire to have heating plant near the main power plant and the general physical characteristics of the building. Too many times the heating plant is compelled to shift for itself, due to lack of care on the part of the engineer of works to give its importance due weight. Usually it is the last thing to be considered and is taken up when the funds are low, the result being that it is crowded in some way or other. This should not be, for when its use is required it is really the key to the operation of the establishment and its failure means many times the interest on the cost of a well designed well installed heating plant.

The Problem of Distribution.

The question of air distribution is one that has caused a great deal of discussion and there is a wide variance in opinion and in practice. A building of several stories, ceiling 10 to 20 feet high, can frequently be heated satisfactorily from a central standpipe blowing the length of the building for distances of 100 to 150 feet when the building is 50 to 75 feet wide. The ceilings tend to confine the air and diffuse it sufficiently. A machine shop of the gallery type may be treated perhaps in this way with limited distribution by blowing the air lengthwise of the lean-tos under the galleries. But if the building is not reasonably tight or subjected to frequent opening and closing of doors it is necessary to distribute properly throughout and especially to those parts affected by steady and intermittent inflows of cold air. The design of the distributing system is affected by the recirculation method of operation. If all of the air is taken from outside of the heated space there is an equal leakage from the building that materially prevents the inflow of air; and a much better distribution of heat is obtained with limited distributing pipes than when the air is all or in part returned from the building. It is practically always desirable to recirculate the air in industrial heating, ventilation not being a factor, because of the economy in steam consumption. In a very leaky building it becomes desirable to use a large percentage of outside air in order to overcome the drafts due to leaks; the same apparatus although apparently inadequate when returning the air has properly performed its duty with all outside air, although more steam would naturally be condensed in the latter case. A particular installation showed a temperature increase of 20 percent when using outside air entirely, the building being very leaky and subject to continual opening of doors. The situation was further complicated by the presence of exhaust fans drawing material from the mill, consequently air; the exhaust fans having about 60 percent of the heating fan capacity.

High shop buildings require an extensive system of distribution to spread the heat thoroughly before it can rise from the floor and be lost so far as properly performing its function is concerned. Not only should the main branch pipes be carried to extreme points but the outlets should be carried down within a few feet of the floor line. The idea of simply injecting heated air into a room thirty or forty feet high and depending upon its properly diffusing is not founded upon a proper conception of the situation, especially where the recirculation method is used with apparatus in the same room. This is an extreme case but it is nevertheless intended to cover all arrangements of limited distribution through greater than thirty feet from main trunk pipe where buildings of the above height are treated. The reasons are obvious and practical examples may be cited to substantiate it.

The railway paint shop is a problem that requires careful treatment as to distribution. The working temperature should be about 70 degrees with air distributed evenly to all parts insuring equal heat low velocities of discharge to avoid suspension of dust and dirt in the air, that may be deposited on a freshly painted surface. Besides the primary object of heating in a paint shop the fan system assists in the rapid drying of paint by circulation and the unavoidable ventilation accompanying this method of heating has an opportunity of being utilized.

As to the advantages or disadvantages of the overhead or underground distribution the one opposed to the other or vice versa, the conditions are the usual solution to the question. The overhead system is more common, principally because it is cheaper than the underground; and although the heating is usually forgotten when the building is designed and other equipment is laid out, the piping can be arranged for in some way even though the scheme may not be as simple as it might have been had the matter been attended to in due season. Underground ducts although more expensive because of frequent expensive excavating and other reasons have their advantages. They may be necessary also where all floor space is covered by traveling cranes. They are permanent in character and are entirely removed from sight and possess the great advantage of delivering heat where it is the most effective, at the floor line or slightly above it.

Area of Main Pipes and Branches.

The design of the proper area for the mains and branches of a distributing system is a comparatively simple matter. The main trunk is usually made equal in area to the fan outlet. Fan outlets bear such a relation to the capacity that a velocity

of 2,500 per minute is present in the main trunk at 1 oz. speed. The desirable branch outlet velocities range from 1,000 to 1,800 feet per minute. The unit space being determined the branch pipe is of proper size to give the desired velocity while carrying the proper proportion of heated air for that space. Friction is allowed for by gradually decreasing the velocity in the main ducts as they recede from the fan. In an undivided space to be heated the outlet pipes are of a uniform size. A short method in this case is to make the total area of outlets 25 to 40 percent greater than the fan outlet. The trunk sizes are then computed from the outlets back to the fan or the outlet areas. The same results are obtained as when areas are based on velocities. As a matter of fact any system of distribution may be figured in this way even though the space is cut up and not uniform.

A direct connected steam engine is usually the most desirable way to operate a heating fan for a factory building, because the speed of the outfit can be varied at the engine throttle to suit the weather conditions. The matter of temperature regulation is therefore very simple; a desirable condition to attain. Engine driven fans are desirable unless it would be necessary to carry the live steam for engine a long distance, although plenty of exhaust steam is available for heating purposes near at hand. Of course where there is insufficient exhaust steam for heating purposes a steam engine is far preferable to a motor as the engine exhaust is utilized for heating, practically eliminating the cost of operating the fan. It may appear that where plenty of exhaust steam for heating is available an electric motor would be more economical, because a unit of power can be generated far more economically in a large generator than it can in a 20-h. p. steam engine for instance. But consider the fact that the average power consumption through the season is about 60 percent of the maximum load. The engine can adjust itself to take advantage of all weather variations. On the other hand the motor must not only be proportioned for the maximum speed but must operate at that speed or what amounts to the same thing as far as power consumption is concerned, for some of the current must be dissipated in a rheostat to cut down the speed. It is true volume dampers might be placed in the main air ducts to cut down the fan delivery thus cutting down the power required, but these dampers would never be operated. An engine driven fan is also independent of the main power plant and it is possible to heat the building nights and Sundays when the main plant is usually idle.

With large floor areas under the same roof it is desirable to break up the heating apparatus into units where possible. It is also frequently necessary for the requirements exceed the limits of fan sizes. The unit arrangement simplifies the distribution, avoids large duct sizes, and in mild weather one or more units will perform the duty. Under such conditions other factors being eliminated, electric fans are desirable. The matter of ventilation has not been touched upon although it is an unavoidable accompaniment of the fan system of heating. It is seldom considered in connection with factory heating as the natural inflow and leakage is sufficient for all practical purposes. If it is necessary where the number of operatives is large, it is a simple matter to arrange to take some air from out of doors, or all, in fact. However, the plain fan system heating plant is frequently able to greatly relieve conditions during uncomfortably warm weather, either by placing outside air into the building or simply keeping up a circulation of inside air. The coils may even be used for circulating cold water if a supply is convenient; this may be an expensive adjunct for the short time of use but the result is effective.

Pointing out the advantages of the fan system over others, although possibly it is unnecessary, the convenience of operation is readily apparent. The whole system can be controlled from a central point. The heating surface is centrally located in a small space so that positive drainage is insured avoiding leaks and the resulting damage. The heating surface is made most efficient, reducing the amount. The heat is distributed evenly, insuring a uniform temperature and the workman has no excuse to lose time standing around a radiator or stove. Although ventilation is usually unnecessary it is always present when desired, and it is not an expense when undesired.

Although the discussion has been limited to the one topic of factory heating, this represents really the simplest form of hot blast heating. School buildings, church edifices, theaters, court houses, in fact all types of public buildings demand all the refinement of the art. The matters of adequate ventilation, temperature regulation, air filtering devices, noiseless of operation both in the machinery itself and air velocities in ducts and registers, economy, all these factors complicate the problem and require the most careful study and treatment on the part of the designing engineer. The mere fact that all of these demands may be met indicates the comfort-giving, likewise sanitary qualities of the system, which together with the simple factory heating problem, substantiates the claim of great versatility for the fan system of heating and ventilation.

FOUNDRYMEN FROM THREE CITIES.

The Philadelphia Foundrymen's Association entertained the members of the Pittsburg Foundrymen's Association and the New England Foundrymen's Association at a "vaudeville dinner" at the Manufacturers' Club in Philadelphia, the evening of May 4. In accordance with the outlined program the blast went on at 6:30 and the pouring off continued for several hours and more. In the department of the program set down as "Foundry fixtures and office furniture," Thomas Devlin appeared as "The Old Man;" Howard Evans presided in the capacity of "Cupola Boss;" Josiah Thompson, "Labor Agitator;" George C. Davis, "Original Alchemist;" George S. Rominger, "Blast Gauge;" J. H. Sheeler, "Spark Arrester;" and Dr. Elmer E. Brown, "Blower." The toasts were announced as "Pickings from the scrap pile," and there were twenty-eight selections. Interspersed between the toasts were a number of excellent vaudeville acts.

Thomas Devlin as president of the Philadelphia Foundrymen's Association, introduced Dr. E. E. Brown as toastmaster. Mr. Devlin called attention to the birth of the general foundrymen's association movement which occurred about eight years previously at Philadelphia, when the American Foundrymen's Association was organized. The National Founder's Association came on subsequently as the result of the spirit of good fellowship displayed at this initial gathering.

A. E. Outerbridge Jr., of Philadelphia, spoke to "The Triplets—Boston, Pittsburg and Philadelphia," and limited each journey to sixty seconds, as one of the shop rules provided that no molder was allowed more than three minutes to pour off, and no slopping over was permitted under any circumstances. A. W. Slocum, president of the Pittsburg Foundrymen's Association, attempted to solve the problem, "Was it the moon or an elusive St. Louis Fair subscription?" and for his effort he was voted a "jolly good fellow." Dr. Richard Moldenke, secretary of the American Foundrymen's Association, told of "A model foundry exhibit as an educational factor" in a most original way, and before his allotted 180 seconds elapsed succeeded in impressing those present with the necessity of their presence at the Indianapolis convention next month. John Birkinbine attempted to solve the conundrum, "If the Ship Trust is only a bubble, why are the stockholders in the consomme?" and following him Stanley G. Flagg Jr., explained why a foundryman was justified in taking orders at cost in order to keep his plant running. Theodore H. Colvin tried to explain what the yield of burnt iron is and also told how he arrived at these conclusions, while S. G. H. Fitch was rather embarrassed in being requested to answer for the necessity of opening a keg when the foundry runs the first heat.

William H. Ridgway, of Coatesville, Pa., successfully answered his toast, "If the biler busts, what will we hook her to?" His remarks furnished food for thought and were given additional weight by being brief and to the point. He asked how many foundrymen took sufficient interest in their molders to extend sympathy and assistance in time of trouble. How many visited their men at their homes who were kept in on account of illness, and how many sent around the pay envelope every week when their faithful employes were unable to earn a livelihood on account of illness. He expressed the opinion that a little more of this sort of attention on the part of employers would greatly minimize strikes if not preventing their occurrence entirely and the National Founders' Association would not be a necessity. It is needless to say that

these remarks were vociferously applauded. Henry A. Carpenter explained what Providence had to do with the cotton corner, while W. S. Hallowell told why foundrymen should agree on prices.

During the evening a telegram from J. A. Holmes, chief of the Mines and Metallurgy division of the St. Louis World's Fair, was read by Toastmaster Brown. Mr. Holmes said that the St. Louis Exposition had agreed to bear the expense of a foundry building for the foundry exhibits and stated that it would be ready for the exhibitors in a few weeks. Foundry equipment concerns have taken space and the success of the exhibit is assured. This building, at Mr. Holmes's request, is to be the headquarters of all the foundrymen during the fair.

Satirical songs were sung as follows: "The Same Old Crowd," "World's Fair Foundry Exhibit Committee," with music to "Bedelia;" "The Foundry Exhibit at the World's Fair, 1904," music to "When Johnnie Comes Marching Home." One of the pleasantest features of the entertainment was the presentation of three gavels to the associations represented, Howard Evans making the presentations. The wood from which the gavels were made was taken from one of the planks of the "Constitution," and each gavel contained an inscribed silver plate in commemoration of the occasion. The following members and guests were present:

F. E. Stockwell, secretary New England Foundrymen's Association, Barbour-Stockwell Co., Cambridge, Mass.
E. E. Durant, Geo. F. Warner Mfg. Co., New Haven, Conn.
Hy. Souther, Souther Engineering Co., Hartford, Conn.
Theo. H. Colvin, Colvin Fdy. Co., Providence, R. I.
L. H. Harper, Becker-Brainard Mach. Co., Hyde Park, Mass.
H. A. Carpenter, A. Carpenter & Son Foundry & Machine Co., Providence, R. I.
S. G. H. Fitch, Vaughn Machine Co., Peabody, Mass.
Dr. Richard Moldenke, secretary American Foundrymen's Association, New York.
A. W. Slocum, president Pittsburg Foundrymen's Association, National Car Wheel Co., Pittsburg.
A. A. Coburn, C. W. Johnson, Coburn Trolley Track Mfg. Co., Holyoke, Mass.
D. C. Warren, *The Foundry*, New York.
A. O. Backert, *The Iron Trade Review*, Pittsburg.
Eric H. Ewertz, Victor Metals Co., East Braintree, Mass.
Chas. H. Newcomb, Matthew Addy & Co., Philadelphia.
John Birkinbine, M. E., Philadelphia.
Dr. David T. Day, U. S. Geological Survey, Washington, D. C.
Darwin Almy, Providence Steel Casting Co., Providence, R. I.
Mr. Robertson, Field-Evans Iron Co., Pittsburg, Pa.
G. C. Schade, Braddock Machine & Mfg. Co., Pittsburg.
Thos. Devlin, Thos. Devlin Mfg. Co., Philadelphia.
Dr. E. E. Brown, E. E. Brown & Co., Philadelphia.
J. H. Sheeler, Sheeler-Hemsher Co, Philadelphia.
Josiah Thompson, J. Thompson & Co., Philadelphia.
Geo. C. Davis, chemist, Philadelphia.
Geo. S. Rominger, Girard Iron Works, Philadelphia.
Howard Evans, J. W. Paxson Co., Philadelphia.
F. E. Hemsher, Sheeler-Hemsher Co., Philadelphia.
Richard C. Oliphant, Trenton Malleable Iron Co., Trenton, N. J.
Stanley G. Flagg, Jr., S. G. Flagg & Co., Philadelphia.
Wm. H. Ridgway, Craig Ridgway & Son, Coatesville, Pa.
Wm. S. Hallowell, Harrison Safety Boiler Works, Philadelphia.
H. P. Jackson, Harlan & Hollingsworth Co., Wilmington, Del.
F. Cooper Pullman, J. Wesley Pullman, Philadelphia.
Thos. B. Harkins, T. B. Harkins Foundry Co., Bristol, Pa.
C. C. McKee, Mgr., J. Atkinson, Jas. Smith Woolen Machy. Co., Philadelphia.
J. S. Robeson, L. H. Woddrop, American Glutrose Co., Camden, N. J.
H. L. Tripple, The Fairbanks Co., Philadelphia.
Geo. M. Benkert, Williamson Bros. Co., Philadelphia.
W. E. Farrell, Diamond Drill & Machine Co., Birdsboro, Pa.
C. D. Matthews, Camden Iron Works, Camden, N. J.
Thos. J. Fegley, North Bros. Mfg. Co., Philadelphia.
H. C. Matlack, Frank Samuel, Philadelphia.
L. A. Hickley, Davis Coal & Coke Co., Philadelphia.
A. E. Outerbridge, Jr., Wm. Sellers & Co., Philadelphia.
Benj. Holt, Camden Fdy. Co., Camden, N. J.
Thos. Hobson, A. A. Miller, *Iron Age*, Philadelphia.
A. H. Blackburn, Green Fuel Economizer Co., Matteawan, N. Y.
Geo. R. Sullivan, Rogers, Brown & Co., Philadelphia.
H. A. May, Jr., Theo. B. Rohrman, Philadelphia.
Thos. N. Allen, Eynon-Evans Mfg. Co., Philadelphia.
Geo. C. Matlack, Wm. Cramp & Son S. & E. B. Co., Philadelphia.
D. J. Thomas, Eynon-Evans Mfg. Co., Philadelphia.
H. W. Coleman, Edw. Page, J. K. Dimmick & Co., Philadelphia.
J. S. Hibbs, J. W. Paxson Co., Philadelphia.
D. G. Moore, 424 Westminster Ave., Elizabeth, N. J.
T. Jas. Fernley, National Hardware Association., Philadelphia.
Jas. A. Beckett, Walter A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y.
Albin Garrett, India Refining Co., Philadelphia.
W. H. Magoffin, Atlantic Varnish & Dryer Co., Philadelphia.
Dr. Wilmer Krusen, Philadelphia.
C. R. Brown, H. T. Brown, A. D. Wallace, E. E. Brown & Co., Philadelphia.
Fred. Stahl, John McCrystal, H. E. Pierce, Girard Iron Works, Philadelphia.
Godfrey Luckhardt, Jr., Cohocksink Brass Foundry, Philadelphia.
Earle Mark, J. Thompson & Co., Philadelphia.
Saml. B. Gilpin, S. B. Gilpin & Co., Philadelphia.
A. R. Robb, J. Thompson & Co., Philadelphia.
Jas S. Stirling, J. H. Blanchard, the Saml. L. Moore & Sons Co., Elizabethport, N. J.
Chas Brown, A. & F. Brown Co., Elizabeth, N. J.
Saml. L. Moore, Jr., W. G. Armstrong, Moore Bros. Co., Elizabeth, N. J.
W. L. Prince, International Steam Pump Co., Elizabeth, N. J.
Mr. Smith, Ingersoll-Sergeant Drill Co., Easton, Pa.
Wm. A. Perrine, Abram Cox Stove Co., Philadelphia.
Oregon J. Ward, Howe Scale Works, Philadelphia.
F. M. Etting, E. J. Etting Co., Philadelphia.
E. W. Dwight, Chester Steel Casting Co., Chester, Pa.
A. L. Belfield, John R. Goehring, H. Belfield & Co., Philadelphia.
C. Gorman, A. Schroeder, R. J. Bartholomew, W. MacDonald, Schaum & Uhlinger, Philadelphia.
Wm. Hanson, Philadelphia.
Geo. S. Deal, Standard Scale & Supply Co., Philadelphia.
Geo. T. March, S. Baltimore Car & Foundry Co., Baltimore, Md.
Frank M. Bateman, W. O. Steele, Bateman Mfg. Co., Grenloch, N. J.
A. G. Warren, J. W. Paxson Co., Philadelphia.
S A. Hibbs, Moore & White Co., Philadelphia.
W. E. Arnold, L. & R. Wister & Co., Philadelphia.
W. H. Green, Jr., Vulcan Works, Chester, Pa.
G. Weaver Loper, J. F. Challenger, Delaware River Steel Casting Co., Chester, Pa.
Ellis Y. Brown, Downington Mfg. Co., E. Dowingtown, Pa.
H. B. Taylor, Pettinos Bros., Bethlehem, Pa.
Geo. C. Davies, S. H. Baird, Pilling & Crane, Philadelphia.
Edward B. Cook, H. L. Grant, Warwick Iron & Steel Co., Pottstown, Pa.
Philip Weiss, Ingersoll-Sergeant Drill Co., Easton, Pa.
Wm. W. Hearne, H. C. DuBois, Matthew Addy & Co., Philadelphia.
Frank Krug, Jos. Dixon Crucible Co., Philadelphia.
E. H. Mumford, Tabor Mfg. Co., Philadelphia.
Louis J. McGrath, Harry Drinkhouse, M. A. Schoales, Wm. O. Thompson, H. O. Evans, Richard Mott, Wm. J. Devlin, W. E. Devlin Frederick Devlin, T. Frank Devlin, M. D., Jas. Reilly, Thos. Devlin Mfg. Co., Philadelphia.
Oregon J. Ward, Howe Scale Co., Philadelphia.
R. Keables, Janney & Steinmetz Co., Philadelphia.
Louis J. McGrath, Thos. Devlin Mfg. Co., Philadelphia.
John Fleming, S. J. Creswell Iron Works, Philadelphia.
Thos. J. Kelley, Thomas Roberts Stevenson Co., Philadelphia.
Frank T. Wright, U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J.
Luther Shick, I. A. Sheppard & Co., Philadelphia.

Model Foundry at St. Louis.

There has been some misunderstanding among foundrymen concerning the status of the project for erecting and equipping a model foundry at the St. Louis World's Fair. It may be said that while the original project for a building costing $10,000, to be erected with funds subscribed by various foundry and foundry supply firms, has been given up, the exposition authorities, through the Mines and Metallurgy division, of which J. A. Holmes is chief, will themselves provide the building which is now under way and will be practically completed by another week. Exhibits will be made by a number of foundry equipment and supply houses, manufacturers of molding machines and others, and these will be arranged for in the way in which other exhibits are provided, the exhibitor dealing with the Exposition officials. The exhibits are expected to be in readiness early in June, so that the American Foundrymen's Association, which goes to St. Louis on June 10 from its convention in Indianapolis, will find all in place. It is understood that the money subscribed in the canvass made on behalf of the New England, Philadelphia and Pittsburg foundrymen's association will be returned.

The executive and engineering officers of the General Railway Signal Co., which is to be organized by the merging of the Taylor Signal Co., of Buffalo, and the Pneumatic Signal Co., of Rochester, as heretofore stated in these columns, will be located in Buffalo. It is also announced that the Buffalo plant will be enlarged. Both the Rochester and Buffalo companies enjoyed a large increase of business last year.

The American Radiator Co. resumed operations at its steel plant at Springfield, O., May 9. The company advises us that it is not true, as reported in daily newspapers, that it will remove its St. Louis plant to Springfield.

PRESS FOR AUTOMOBILE FRAMES.

The Federal Mfg. Co., of Cleveland, constructed a large press a short time ago for the manufacture of automobile steel frames. Its work is, however, by no means confined to automobile manufacture. The press will take work 17 feet long and 24 inches wide. The machine stands 15 feet high and is 18 feet long, weighs 50,000 pounds and exerts a pressure (squeeze) of 1,200 tons.

The press is provided with a brake operated with a lever so that the stroke, either up or down, may be stopped instantly. The general size of the press may be understood by a comparison of the workman in the picture with the general dimensions of the machine.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Sidney Tool Co., Sidney, O., has been incorporated with a capital of $25,000, to make agricultural machinery. Incorporators are: E. J. Griffis, W. H. Wagner, I. H. Shedieck, W. B. McCabe, J. O. Amos and C. H. Dickas.

The Allentown Electric Construction & Supply Co. has been organized at Allentown, Pa., for the manufacture of all kinds of electrical machinery and appliances. Directors are: Uriah H. Wieand, Walter E. Wieand, W. H. Gangeware, Robert E. Wright and William H. Miller.

The Klahre Mfg. Co., Chicago, has been incorporated with a capital of $2,400, to manufacture tools. Incorporators are: C. C. Reckitt, Gustav Klahre and T. R. Ferris.

The Lenox Iron Works, New York, have been incorporated with a capital of $15,000. Directors are: Martin Hirschburg, I. C. Ferguson and L. C. Simons, New York.

The Hannay Ventilator Mfg. Co., Cincinnati, O., has been incorporated with a capital of $50,000. Incorporators are: W. F. Robertson, J. M. Crawford, A. W. Williamson, William R. Collins and Oberst Burbank.

R. P. Marsh, manager of the Birmingham branch of Charles Churchill & Co., Ltd., the largest handler of American machinery in Great Britain, is now in New York, and it is understood will place a number of orders. His New York address is 23 John street.

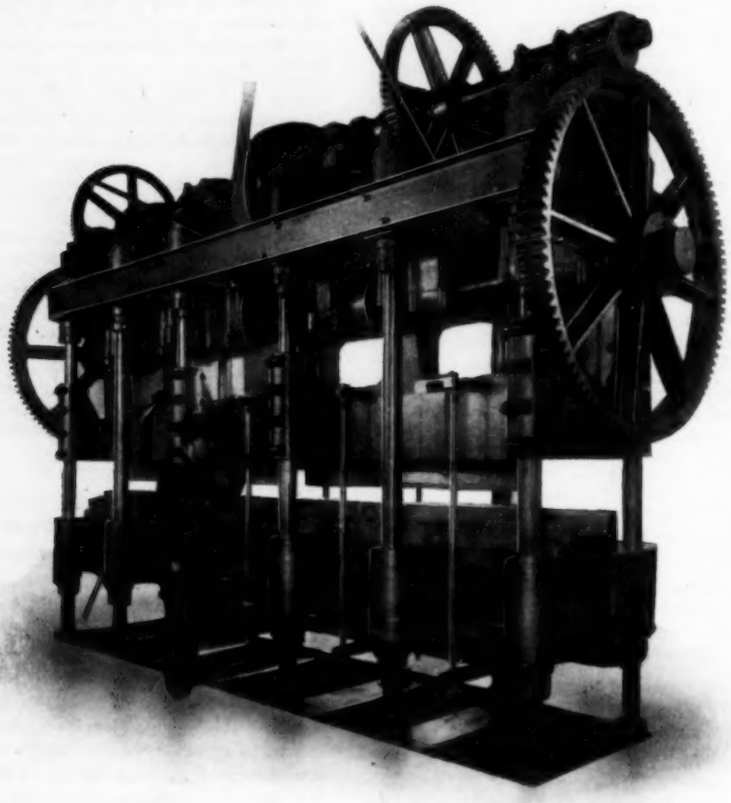
The Cape Breton Iron & Steel Co., Ltd., will erect steel, iron and brass foundry, machine, boiler and forge shops and will spend about $100,000 on a plant this year. Regarding equipment, the company states that it has not made any definite arrangement and is in the market. It will be glad to receive catalogues and other information from manufacturers.

The Canton Steel Ceiling & Mfg. Co., Canton, O., has been incorporated with a capital of $10,000. Incorporators are: W. W. Clark, A. B. Clark, T. C. Belding, J. S. Shanks and W. W. Clark Jr.

The Hance-Brown Casting Co., Columbus, O., has been incorporated with a capital of $10,000. Incorporators are: Harry T. Hance, Samuel Brown, Herbert B. Henderson, Joseph P. Eagleson and John W. Hance.

The Urbana Mfg. Co., Urbana, O., has been incorporated with a capital of $10,000. Incorporators are: Charles G. Kennedy, R. H. Murphy, J. M. Russell, Ira C. Koehne and C. R. Murphy.

The International Machine Co., Adrian, Mich., has been organized to manufacture a fence loom invented by A. E. Kellar. The company will not built at present. The officers of the company are: President, H. E. Hook, Hudson; vice president, Albert E. Kellar, Adrian; secretary, W. E. Cook; and treasurer, J. C. Johnson, Adrian.



PRESS FOR AUTOMOBILE FRAMES.

The Adjustable Wrench & Specialty Mfg. Co., Harvard, Ill., has been incorporated with a capital of $100,000, to manufacture hardware. Incorporators are: P. M. Knippenberg, F. W. Hahn and L. J. Husson.

The Pitometer Co., Chicago, has been incorporated with a capital of $20,000, to manufacture hydraulic appliances. Incorporators are: W. E. Freer, W. D. Roberts and E. H. Johnson.

Rusk Mfg. & Electric Light Co., Rusk, Tex., is in the market for a 40-h. p. automatic engine.

The Victor Iron Works Co., St. Louis, has been incorporated with a capital of $16,000, all paid, to manufacture structural, architectural and ornamental iron. Incorporators

are: Emil W. Kunze, George Wander Jr., Charles W. Loesch, Frank G. Zeis and Emil Zeis.

Trustees of the James Millikin University, Decatur, Ill., have made an appropriation of several thousand dollars for the purpose of fitting shops of that institution with the latest machines and tools.

The Border Bolt & Lock Nut Co. has been organized at Richmond, Ind., with a capital of $30,000, to manufacture bolts and nuts under the Border patent recently granted to Charles Border. The directors are: John M. Lontz, W. L. Thornburg, William H. Alford, Charles C. Border and Attorney Wilfred Jessup. The company is negotiating for a manufacturing plant which is now vacant. Machinery has already been contracted for.

Geo. W. Hartzell, 301 Riffle avenue, Greenville, O., wants 50-h. p. stationary steam engine.

T. J. Campbell, West Palm Beach, Fla., wants catalogues regarding tools and equipment for machine shop.

Birmingham Paint & Roofing Co., Birmingham, Ala., wants a pair of power rolls not less than four feet and power shears; both second-hand.

W. T. Strong, Ozark, Ala., wants to buy tools for the manufacture of plows and scrapers, etc., such as presses, shears, punches, forges, hammers and benders. He also will want later a cupola, shop tools, etc.

The Bonson Furnace & Boiler Co., Chicago, has been incorporated with a capital of $50,000, to manufacture furnaces and boilers. Incorporators are: W. M. Bonson, N. E. Utt and L. I. Flowers.

The Hayes Machine Co., Brooklyn, N. Y., has been incorporated with a capital of $20,000. Directors are: S. W. Low and F. D. Arthur, Brooklyn, and A. W. Fisk Jr., Richmond Hill.

The Dean Mfg. Co., Seymour, Wis., has been incorporated with a capital of $20,000, to run a general machine shop. Incorporators are: F. H. Dean, George Rau, S. M. Randall and Chester J. Dean.

J. S. Holt & Co., Boston, have been incorporated with a capital of $10,000, to deal in machinery, tools, etc. Officers are: President, Joshua S. Holt, Boston; treasurer, Russell S. Holt, Boston; clerk, Eva A. Holt, Boston.

The Excelsior Mfg. Co. & Supply Co., St. Louis, Mo., has been incorporated with a capital of $150,000, to manufacture and deal in tools, machines, etc. Incorporators are: Henry A. Magill, Charles G. Woods and Gilead P. Cheney.

The Davis Counterbalance Locomotive Wheel Co., New York, has been incorporated with a capital of $100,000, to manufacture locomotive wheels. Incorporators and directors for the first year are: E. W. Cushing, R. B. Cushing, and C. Boardman, New York City.

Peacock's Iron Works, Selma, Ala., wants a 12 x 16 plain slide-valve engine (second-hand), 50-h. p. tubular boiler, one flywheel for engine for 5 3/16-inch shaft, pulley 7 feet in diameter, 15-inch face, latter for another engine.

G. B. H. Stallings, Stallings, N. C., will want 40-h. p. boiler and 30-h. p. engine, centercrank.

Simons-Mayrant Co., 16 Broad street, Charleston, S. C., wants one 10-ton locomotive, 10 dump cars, 25 tons 30-pound rails, one 1 or 2-yard orangepeel dredge bucket.

The Lieberman & Sanford Co., New York, has been incorporated with a capital of $15,000, to manufacture iron, brass, etc. Incorporators are: S. Lieberman, C. F. Sanford and H. G. Graf, New York.

The Rochester Shank Co., Rochester, N. Y., has been incorporated with a capital of $40,000, to manufacture steel shanks. Incorporators are: F. S. Reed, L. A. Reed and S. B. Tompkins, all of Rochester.

The Hagan Gas Engine & Mfg. Co., Winchester, Ky., has been incorporated with a capital of $75,000. Incorporators are: D. L. Pendleton, president; Hub L. Stevens, vice president; Lee Todd, Ford, Ky., secretary; and L. T. Hagan, treasurer and general manager. A site has been purchased and work on a factory building will begin at once.

The Niagara Blower Co., Buffalo, N. Y., has been incorporated with a capital of $25,000. The company will make and sell engines, boilers and blowers. Directors are: Maulsby Kimball, Henry Gulnaur and Hart Lincoln.

The Madisonville Wagon Works have been incorporated at Madisonville, Ky., with a capital of $15,000, and will build and equip a plant having a capacity of 300 wagons per day. The incorporators are: W. T. Davies, president and general manager; W. L. Brown and C. E. Owen.

Fires and Accidents:—

Fire in Fred W. Wolf's refrigerating machine factory, 139 Rees street, Chicago, resulted in the almost complete destruction of the building and machinery. Loss will amount to $90,000.

New Construction:—

The Illinois Central railroad has announced that it will double the capacity of its shops at Memphis, Tenn. An expenditure of $250,000 will be made.

The Riter Conley Mfg. Co., of Pittsburg, has been granted a permit for the erection of the proposed armor plate tempering plant to be built for the Midvale Steel Co. at its works at Nicetown, Pa. The structure will cost about $100,000 and will be used in the manufacture of armor plate for the government. The building will be constructed of corrugated iron on iron frame and will consist of three spans. One span will measure 68 x 504 feet, one, 68 x 432 feet, and the third, 32 x 378 feet. Traveling cranes are to be installed. The work will be pushed rapidly to completion.

The Baldt Steel Casting Co. has a large force of men at work on its new buildings at New Castle, Del. Work on the plant of the Brylgon Steel Casting Co.'s plant which adjoins the Baldt plant is progressing satisfactorily and it is expected that it will be ready for operation on July 1.

The Mexican Car & Foundry Co. advises us that it is building a large car plant and will erect a foundry to make car castings only. A little later the company will install a malleable iron plant, brass foundry and wheel foundry. The capacity of the shop will be about ten cars per day. The plant is located three and a half miles north of Mexico City, between the Mexican National and Mexican Central main lines. Isaac M. Hutchinson is president and general manager.

The George H. Smith Steel Casting Co., Milwaukee, whose plant was recently damaged by fire, informs us that its main foundry building was almost totally destroyed, but fortunately it had nearly completed an addition to same, which was not damaged and which the company will operate within a few days, so that it is in position to handle any trade which may come to it. The company expects to rebuild the main foundry immediately, using brick and iron in the construction, and hopes to again have its entire plant in operation within four to six weeks.

An agreement has been reached by officials of the Wheeling & Lake Erie railroad and the Board of Trade, of Canton, O., by the terms of which the citizens of Canton will contribute $12,000 for the purchase of additional land, and the shops of the railroad which were burned a few months ago are to be rebuilt. The company agrees to expend $100,000.

C. W. McFarlane, Orange, Tex., will build a machine shop and foundry at Alexandria, La., at a cost of $50,000.

The McCaskey Register Co., Alliance, O., has increased its capital stock from $30,000 to $100,000, and will at once begin the erection of a brick plant, 40 x 110 feet, two stories, especially designed for the manufacture of registers.

The Cleveland Foundry Co., Cleveland, is rebuilding its japan building and ovens which were destroyed by fire in January.

In order to have larger facilities, the Otto Gas Engine Co., of Philadelphia, will build a new plant at Wilmington, Del. At the works in Philadelphia, engines of 150 h. p. are the largest built, but at the Wilmington plant it is intended to build engines of 2,000 h. p. It is expected that within two or three years the plant at Philadelphia will be abandoned.

The work of clearing away the burned portions of the plant of the Malleable Iron Mfg. Co., Marion, Ind., destroyed by fire April 28, preparatory to rebuilding, was commenced the day after the fire, and the new building will soon be in course of erection.

The two new blast furnaces which the National Tube Co. is building at Lorain, O., will soon be completed. It is expected that No. 3 will be in blast by June 1.

General Manager Carpenter, of the Pere Marquette railroad, announces that it has been definitely decided that the

road will erect its shops in Grand Rapids, Mich. A power house, blacksmith shop, machine shop and other buildings will be erected. The cost of construction will be about $200,000, in addition to which $75,000 will be expended for machinery. The Pere Marquette will also erect shops at St. Thomas, Canada.

The Devlin Iron Co.'s plant at Burlington, N. J., is to be enlarged by the erection of a three-story structure, to contain machine shops, galvanizing department and assorting rooms.

The Greenlee Co., which moved part of its shops from Chicago to Rockford, Ill., last fall, will erect a machine shop, 355 x 165 feet.

Excellent progress is being made in the erection of the tin plate plant of the Follansbee Bros. Co., of Pittsburg, at what is known as Mahan's on the opposite bank of the Ohio river from Steubenville. The company has a tract of 232 acres, of which 40 acres have been set aside for the building of the tin plate plant. It will have six tin plate mills and two sheet mills. The hot mill building is 440 x 90 feet; the cold mill, 480 x 115; the tin house, 400 x 50 feet, and the boiler house, 100 x 40. These buildings are already erected. Most of the heavy machinery is on the ground and much of it has been placed. The engines have not yet arrived, but are expected in about a month. It is expected that the plant will be in operation in August.

The Ohio Motor Co., Sandusky, O., has awarded the contract for an addition, 60 x 190 feet, to be constructed of brick and steel with a concrete floor.

The Warwood Tool Co., Wheeling, W. Va., is having plans prepared for the erection of a building, 60 x 450 feet, of steel and frame construction. The machinery will be electrically driven.

E. E. Marshall and E. L. Harris, of Louisburg, N. C., have organized the Louisburg Plow Co., and will erect two buildings, one to be one story, 40 x 50 feet, and one to be two stories, 46 x 50 feet. Machinery has been ordered.

In a month or so the excavation work for the building of the new Southern Indiana railroad shops at Terre Haute, Ind., will be begun. The shops will have a capacity for 50 engines and 1,200 cars per year.

The Muscatine Machine Co., recently organized at Muscatine, Ia., is preparing to build, equip and operate a machine shop.

The American Arithmometer Co., manufacturer of adding machines, is about to let the contract for its new Detroit plant. There will be a building 320 x 125 feet with an L 195 x 80 feet. The company has a plant at St. Louis which employs about 450 men and it will be continued in operation after the completion of the Detroit plant.

The Lackawanna Railroad Co. will build a number of steel and concrete bridges along the line of its road this summer, including a nine-span structure 1,100 feet long over the Susquehanna river, one of six spans 1,000 feet in length over the Chemung river, a short distance east of Elmira; a 600-ft. bridge of five spans at Mt. Morris; one 450 feet long of three spans at Waverly, and a 200-ft. structure at Campville, involving an expenditure of about $300,000. Upwards of 5,500 tons of steel and 20,000 yards of concrete will be used. A number of steel bridges will also be built along the Cayuga division.

The fire which recently damaged the plant of W. E. Moss, Charles City, Ia., destroyed the second story of the machine shop, containing patterns, wood working machines and tools. The first floor, with engine, machinery and stock, was saved from serious damage and the foundry was only slightly damaged. Mr. Moss will erect a new two-story building at a cost of $2,500.

Plans have been completed and a site will be obtained at once for the erection of the Tennessee Central Railroad Co.'s proposed shops to be rebuilt at Nashville, Tenn., at a cost of $200,000.

The C. M. Kemp Mfg. Co., manufacturer of plumbers' specialties, Baltimore, has engaged the Woodruff-McLaughlin Co., constructing engineer and architect, Lexington and St.

The Reading Iron Co., Reading, Pa., is tearing down the old pipe mill adjoining the new plant and will erect a steel structure to be used as a threading department.

Paul streets, to prepare plans and specifications for manufacturing plant to be located on Oliver street. The architect wants prices and catalogues on the boilers, engines, dynamos, electric elevators.

The Timken Roller Bearing Axle Co., Canton, O., has commenced the erection of two new buildings. Both will be of brick, one 150 x 50 feet and the other, 70 x 50 feet. The plant has been running night and day for some time.

The Reynolds Wire Co., Dixon, Ill., has purchased additional land adjoining its plant and will erect a four-story building. The plant will then be 250 x 150 feet.

The Pittsburg and Valley Districts:—

The tin house of the plant of the American Sheet & Tin Plate Co., Monessen, Pa., is having a large amount of labor saving machinery installed. A new warehouse is also to be erected to double the plant's storage capacity.

The West Virginia Bridge & Construction Co., Wheeling, W. Va., has secured a contract from the Wheeling & Western Traction Co. for six new bridges, with spans ranging from 60 to 85 feet. The company is also making shipment of material for three bridges to Ft. Worth, Texas.

The Orient Coke Co., of Pittsburg, has placed a contract for the erection of 300 coke ovens near New Salem, Fayette county, Pa.

The Metallic & Crucible Steel Co., of Latrobe, Pa., has commenced the erection of the buildings for its plant. A new steel making process is to be introduced.

The South Pittsburg Iron Works, Claysville, Pa., has recently completed a structural erecting plant. E. J. Heaton, formerly connected with the American Bridge Co., has been appointed manager.

General Industrial Notes:—

The new rod mill of the Dominion Iron & Steel Co., Sydney, Cape Breton, has commenced operations. This is the first mill of its kind to be erected in Canada. The initial run was pronounced highly successful by officials of the Morgan Construction Co., of Worcester, Mass., which erected the plant. It has a guaranteed capacity of 200 tons per day, but is now in operation to only about half its capacity. Application has already been made to the government for a duty on steel rods, which at present are admitted free, as they have never been made in Canada before.

The Cincinnati Metal Co., recently incorporated, will manufacture all grades of babbitt, solder and type metals, and will sell pig tin, lead, copper, spelter, antimony, etc. The company has secured a desirable building at 227 W. Fifth street. Officers are: Arthur E. Jones, president; H. W. Wayne, vice-president; and Malcom McAvoy, secretary.

The National Simplex Voting Machine Co., Anderson, Ind., has leased the buildings of the Anderson Window Shade Co., and will soon begin the manufacture of a voting machine.

T. J. Campbell and B. F. Carter have purchased, and will improve, enlarge and operate the Miller Machine Works, West Palm Beach, Fla.

The St. Paul Foundry Co., St. Paul, Minn., has received the contract from the navy department for the construction of a steel storage building at the Puget Sound navy yard. The bid was for $30,726.

Thomas G. Morris, a well known agricultural implement manufacturer, has formed a company which has taken over the property of the Hussey Mower Co., of Knightstown, Ind. The new company is incorporated with a capital of $200,000. The company has the plant completed and machinery installed at Knightstown and a fine exhibit of the mowers will be made at the World's Fair.

The Commonwealth Steel Co., whose plant at Madison, Ill., has been closed since June, 1903, is preparing to resume operations.

The National Air Brake Co., Buffalo, N. Y., recently incorporated, does not intend at present to do any building, as it is doing its work satisfactorily under contract. The company manufactures and sells street car brakes which have met with much favor in the trade.

O. B. Taneyhill has sold his interest in the Kelly & Taneyhill Co., Waterloo, Ia., to L. S. Parsons. The company was established in 1867 for the purpose of manufacturing well drilling machinery.